How To Create An RL Unit Selection

Select Cooling Coating:

Select whether the cooling coil has copper fin, phenolic coating, or stainless steel casing.

Select Cooling Staging:

For DX systems the number of available stages = number of compressors. DX compressor staging can be equal to or less than the number of compressors. For chilled water coils, staging is used to select full and half circuited coils on the conditions screen.

Select Heating Type:

Heating may be electric, gas, hot water or steam. For electric heat and gas heat you will later enter the desired leaving conditions and the program will select the number of heaters required, therefore under Heating Designation no entry is required. For Steam and Hot Water heat you will have to select the coil size on the conditions screen.

Select Heating Designation:

For Steam and HW coils choose coil type.

Select Heating Staging:

For electric and gas heat the number of stages = the number of heaters x 2. Available selections are 2, 4, 8, or 12 stages not to exceed the number of heaters x 2. For HW coils choose full or half circuited coils. For Steam coils no choices.

Next proceed to feature options by clicking on the feature button. Note that features are to the right of the semi-colon. Select features and options.

Feature 1A: Select Return and Outside Air:

Choices are manual outside air damper, economizer dampers, return fan, exhaust fan, heat wheels, 100% outside air no return air and no damper, 0-50% outside air with two position damper, 100% outside air with 2 position damper. If any heat wheel is select the program will determine which heat wheel to use based on the outside air quantity entered under the conditions input to be described later.

Feature -1B,1C,1D: Exhaust and Return Fan Configuration, Blower and Motor:

If a return, exhaust or heat wheel is selected the program will automatically cause you to run the exhaust/return fan selection program after the supply fan is selected.

Feature 2: Select O/A Control from codes in the right column.

How To Create An RL Unit Selection

Feature 3: Select Discharge Location

Note: The back of the unit is the side opposite the access doors. The front of the unit is the side with the access doors. The discharge location may be constrained by other options selected.

Feature 4: Select Return Location

Note: The back of the unit is the side opposite the access doors. The front of the unit is the side with the access doors.

Feature 5A, 5B, 5C: Supply Air Blower Configuration, Blower and Motor.

The supply fan will be user selected in the fan program after feature selection is complete and you click OK.

Feature 6A: Select Pre-Filters

Pre-filters are upstream of the cooling coil and may consist of a pre and final filters. Alternately a pre-filter may be located upstream of the cooling coil and the final filter at the outlet of the unit.

Feature 6B: Select Final Filter

This feature serves several purposes.

a. If the pre-filter selection is (0, A, B) and the unit is draw through then the final filter can be selected. The filter box choice allows selection of different filter areas. Make sure you check the filter velocity on rating report.
b. b. If the pre-filter choice is (C through M) then the pre and final filter are in the same frame located upstream of the cooling coil. The filter box choice allows selection of different filter areas. Make sure you check the filter velocity on rating report. Filters at the outlet of the unit are not allowed for draw through systems or gas heat systems.

Feature 6C: Select Filter Options

This feature allows selection of a clogged filter switch and magnehelic gauges.

Feature 7: Select Refrigerant Controls

Feature 8: Select Refrigerant Options

Feature 9: Select Refrigerant Accessories

Feature 10: Select Power Options

Select either Standard Power Block or Power Switch. If any power switch is selected the program will determine the amperage and select the correct power switch.

Feature 11: Select Safety Options

Feature 12: Select Controls

How To Create An RL Unit Selection

Feature 13: Select Special Controls

Feature 14A: Select Preheat Configuration

Note the preheat coil can be in the outside air stream (OA) or the mixed air stream. If a preheat coil is desired in the mixed air stream it requires you to select a 4 foot long feature box. Preheat coils may be steam or hot water only.

Feature 14B: Select Preheat Sizing.

This feature contains the choice for coil face area done on the conditions screen.

Feature 15: Select Option Boxes

The option box allows installation of blank sections for additive components such as humidifiers or special filters.

Feature 16: Select Cabinet Options

Feature 17: Select Additional Cabinet Options

Feature 18: Select Customer Code (Not Used with RL)

Feature 19: Select Code Options

Feature 20: Select Unit Splits

If the unit is over 52 feet then the program will automatically include a split.

Feature 21: Select Evaporative and Water Cooled Condenser Options

If an evaporative or water cooled condenser was previously chosen then select desired options.

Feature 22: Blank

Feature 23: Select Type

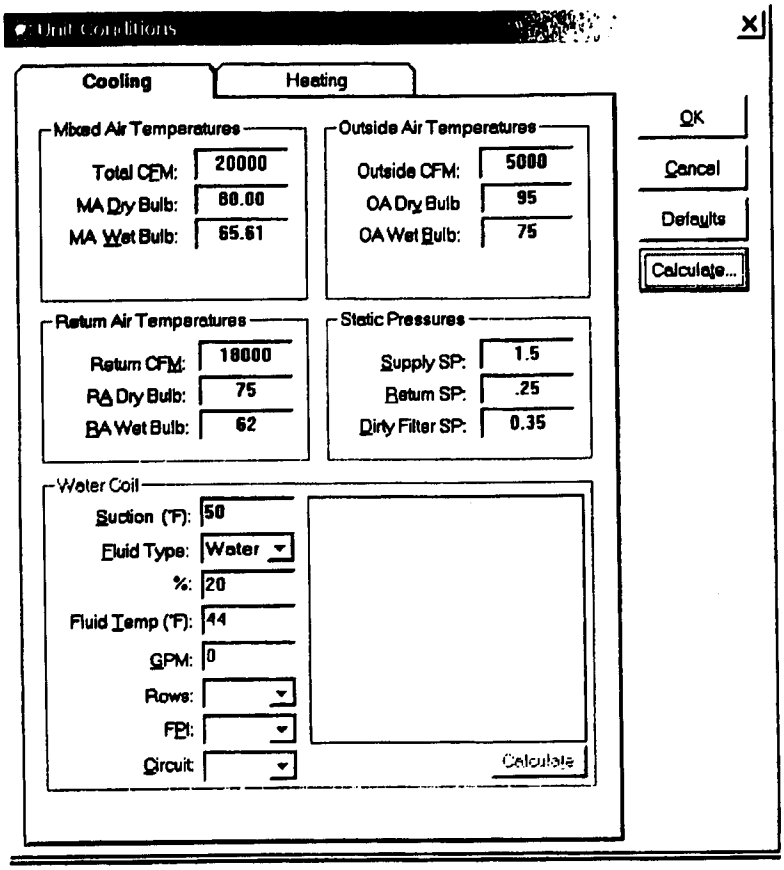
Enter special authorizations

3. Next Click on Conditions:

The Conditions Screen has two sections; Cooling and Heating, and allows the entry of all performance data for the cooling or heating components depending on the model and feature codes. The conditions screen allows the input of outside, return and supply cfm's used to perform mixed air calculations.

How To Create An RL Unit Selection

DX COOLING CONDITIONS SCREEN:



Enter Total CFM (Supply Air CFM), Outside Air CFM, OADB, OAWB, Return Air CFM, RADB, and RAWB. Click **[Calculate]** to determine Mixed Air Dry Bulb and Wet Bulb temperature. You can override the calculated MADB/MAWB by entering them directly without clicking **[Calculate]**. The minimum return air cfm is:

Return Air CFM ≥ (Supply Air CFM – Outside Air CFM)

The exhaust cfm is computed as follows:

Exhaust Air = Return Air – Supply Air + Outside Air

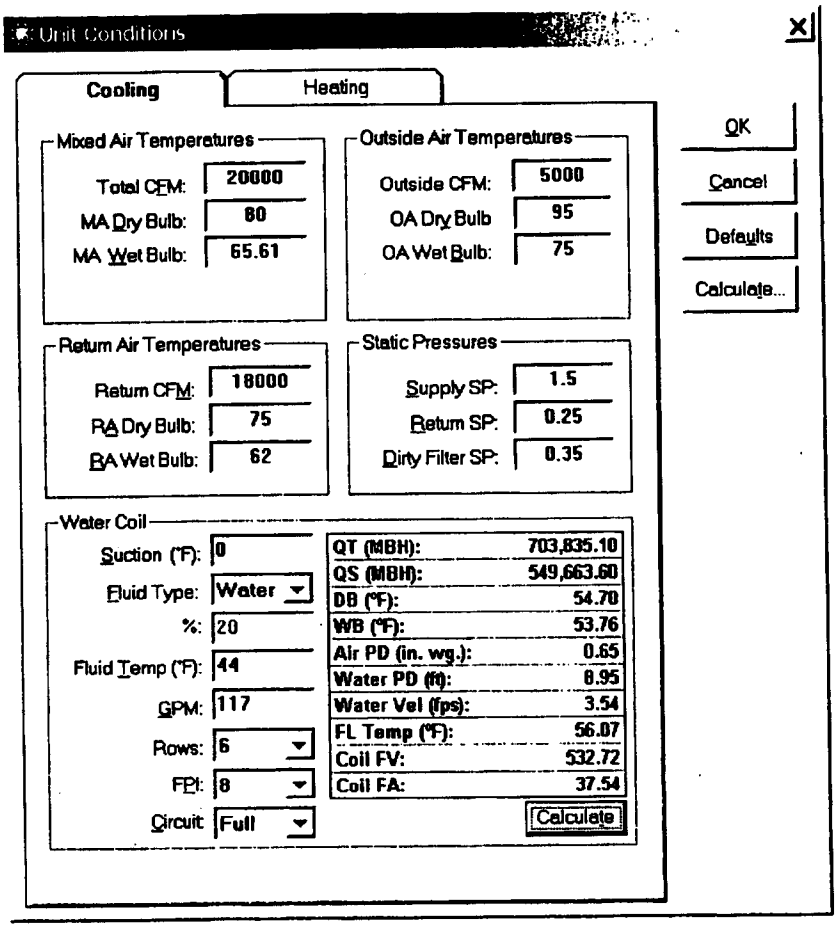
The Exhaust Air CFM must be greater than or equal to zero.

If the return air quantity is too low an error is indicated.

Enter supply fan external static pressure, return fan external static pressure, and dirty filter allowance. Note that if an exhaust fan is selected the user must make sure that the return static pressure is properly accounted for in the supply fan external static pressure. When an exhaust fan is selected the total supply fan external static pressure = discharge static + return static. The maximum allowable exhaust fan external static pressure = .5 in. wg.

How To Create An RL Unit Selection

Chilled Water Conditions Screen:



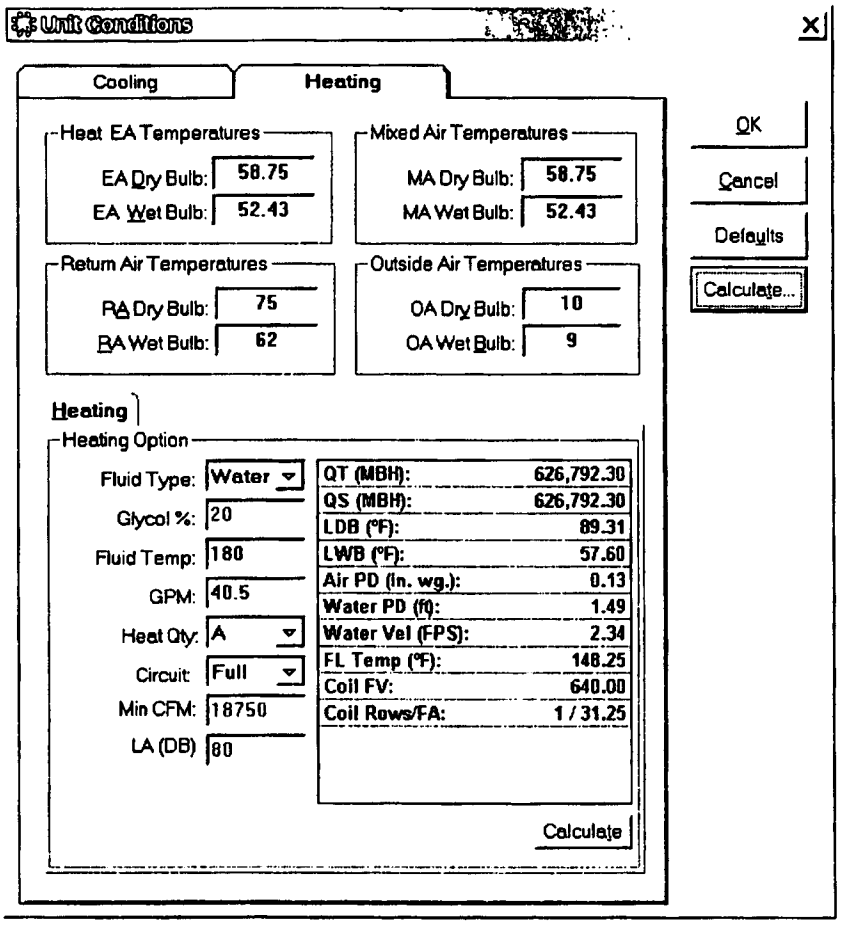
The chilled water conditions screen allows selection of the fluid type, fluid entering temperature, gpm, rows (4,6,8), fpi (8,10,12), and circuiting (full and half). Clicking calculate within the coil window will show the performance of the coil and reset the feature master to the current selection.

If a DX Air-Handling unit is selected enter suction temperature.

Clicking [DEFAULTS] resets the input to the default information.

How To Create An RL Unit Selection

HEATING:

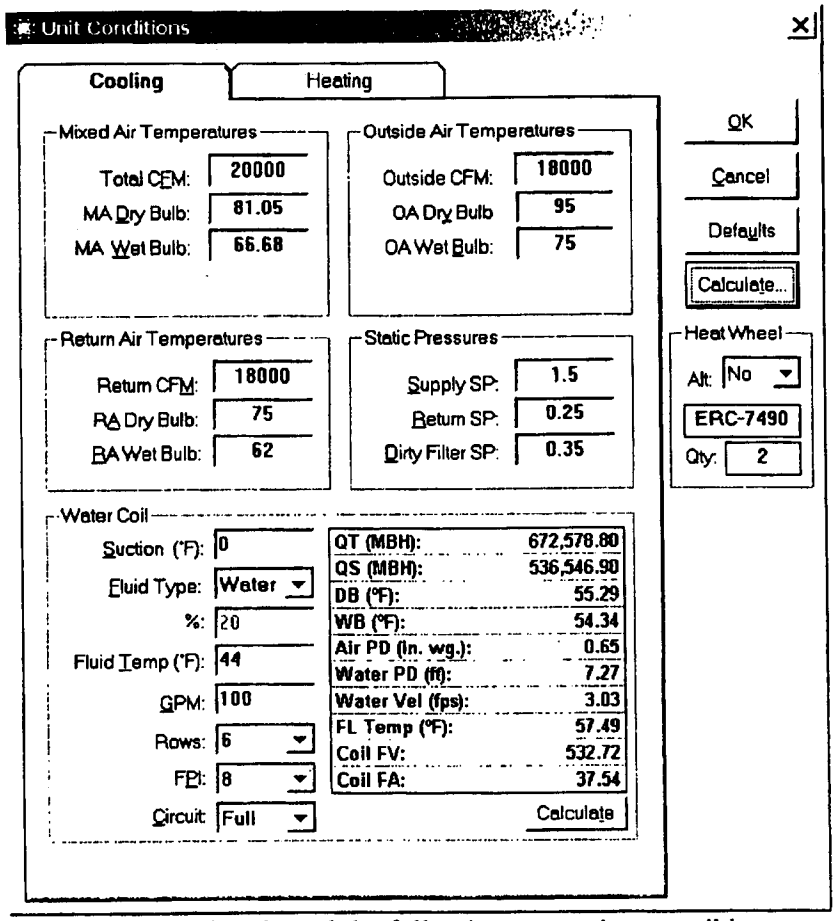


Enter OADB, OAWB, RADB, RAWB Click calculate to determine the mixed air temperature. The mixed air temperature will include the heat gain from the heat wheel and preheat coil. The user can override the mixed air temperature by directly entering the MADB and MAWB. If a heat wheel has been selected the model and quantity of the heat wheel will be shown. Heat wheel selection is based only on OA cfm. If a preheat coil is selected under feature 14A Enter fluid type, %, fluid temperature, gpm, and select coil under heat quantity. The program will calculate the leaving air temperature from the preheat coil. Heating option refers to the main heating section always located downstream of the cooling coil. If gas or electric is chosen enter the LADB and minimum CFM. The heater quantity and actual leaving conditions will be calculated. If hot water or steam is selected enter fluid type, %, fluid temperature, gpm, heat quantity, and circuiting. The LADB will calculate for the selected coil and conditions and the Model Master will be updated.

Clicking [DEFAULTS] resets the input to the default information.

If a heat wheel is selected the following screen appears instead. The user may select a heat wheel one size larger than selected by the program.

How To Create An RL Unit Selection

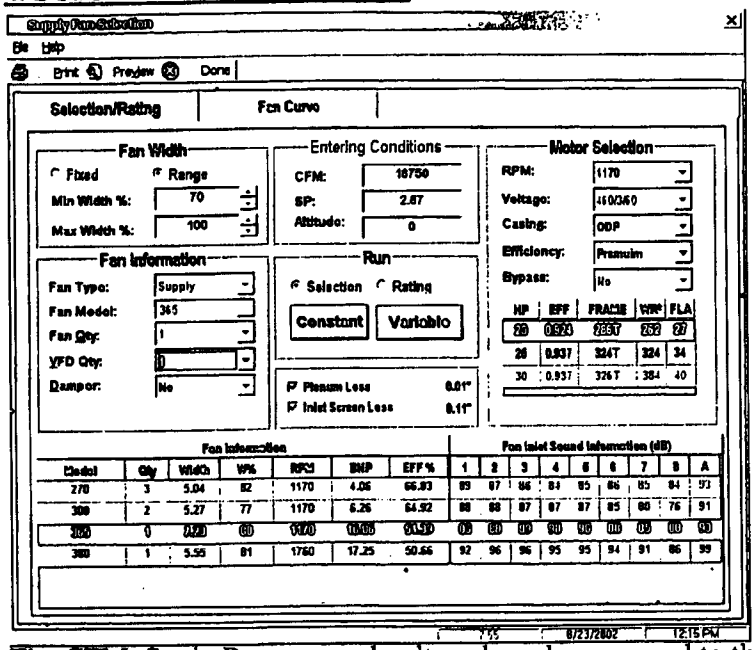


If a preheat coil is selected the following screen is accessible.

Click OK to exit the conditions screen, and OK to enter Fan Selection program

How To Create An RL Unit Selection

4. SUPPLY FAN SELECTION



The CFM, Static Pressure and voltage have been passed to the fan program. To select a fan at either 1170 rpm or 1760 rpm click on **[CONSTANT]**. In this mode the program selects fans by varying blade width. To select a fan at an RPM for best efficiency, click on **[VARIABLE].** The available fans are ordered by efficiency from highest to lowest. Select the fan that best meets your needs by clicking on the fan model. Once the fan is selected select the motor. For variable speed motors choose the number of drives. For constant speed motors you can select standard efficiency motors. Once the fan is selected the inlet screen pressure drop and other internal pressure drops are calculated and added to the static pressure displayed.

When multiple fans are selected you may add fan inlet dampers to allow operation with inactive fans.

In the **[VARIABLE]** option the nominal motor brake horsepower required is computed as follows:

$$BHP_{nominal} = BHP_{Required} \cdot \frac{RPM_{Nominal}}{RPM_{required}}$$

If a VFD bypass is required then:

$$BHP_{Nominal} = BHP_{Required} \cdot \left[\frac{RPM_{Nominal}}{RPM_{Required}}\right]^3$$

To view output of the fan program, click [Preview]. The fan output may also be printed. Inlet and outlet fan sound data is shown on the fan output report. Where multiple fans are selected the sound is for all fans. If two fans are selected the sound for one fan is -3dB from that shown, etc. Click **[DONE]** to exit the supply fan selection program.

How To Create An RL Unit Selection

5. EXHAUST/RETURN FAN SELECTION

If an exhaust, return, or heat wheel was selected under feature 1A then the exhaust/return fan program is activated. The operation is the same as the supply fan program above, except, when [CONSTANT] is chosen the only variable is fan diameter and blade pitch so fans are selected that can be +10%/-5% of the desired cfm.

Click [DONE] to exit the exhaust/return fan selection program.

You have completed the selection and have returned to the main screen!

6. DRAWING A UNIT

To draw RL units click on [DRAWING]. Click [ZOOM EXTENT] to fit the drawing to the page. The drawing is a DXF file and is stored as RL.DXF in the RL-ECat32 directory. You can save this file with any name using [SAVE AS]. You can print the drawing also. Clicking the right mouse button with the cursor over the drawing will access to the drawing program additional features such as redlining, editing, and setting preferences.

The DXF file is a scaled drawing file that can be imported to any CAD program.

When the drawing is printed from the drawing package the resolution is set by the drawing package and a high quality drawing is printed.

When the drawing is printed from the print menu a technique analogous to a screen capture is used and the resolution is set by the screen resolution, and the drawing is WYSIWYG. If your screen resolution is 800 by 600 the drawing will be almost illegible, however, if your screen resolution is 1600 by 1200 the drawing will be a much higher quality.

When the program is shipped the drawing package includes preset defaults, one of which shows the drawing in color. To obtain the best quality drawing, the image should be set to black and white. To do this, proceed as follows:

1. With drawing open and cursor on drawing, click right mouse button.
2. Click Preferences and then Default.
3. Click Display and set it to black and white, then Apply.
4. To make sure the settings are saved when you get back to the drawing click the right mouse button and click Preferences and then Reset.

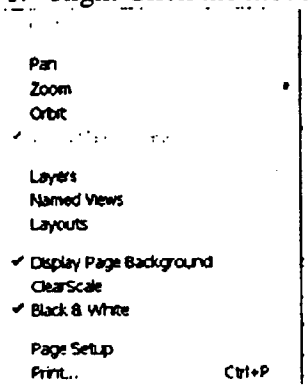
If the line width of the drawing is too light or too dark when printed you can change the line width by proceeding as follows:

1. With drawing open and cursor on drawing, click right mouse button.
2. Click Preferences and then Default.
3. Click Print, Advanced, Line Width
4. Scroll to line 7, which is the black. If the line width is 1 or 2 you are probably ok. If not click on the 7 and set the line width in the box to the right, increasing numbers increase the line density, then click Apply and Ok to exit.
5. To assure the settings are saved, click right mouse button, Preferences, Reset.

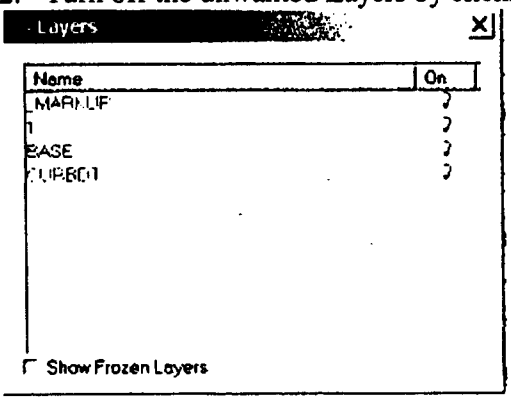
How To Create An RL Unit Selection

When you create a .DXF drawing file and open it with a viewer such as, VoloView Express, it will appear as a Layered drawing with four Layers. The first Layer being the markup or redline, the second is the unit drawing, the third is the curb drawing, and the fourth is the base section. To select Layers to view you will need to turn off the layers you do not want to see. In Volo View Express you would proceed as follows:

1. Right Click the mouse on the drawing and select Layers from the menu:



2. Turn off the unwanted Layers by clicking the appropriate Light Bulb:



If you do not have the latest version of Volo View Express you can download a free copy from the link below:

http://usa.autodesk.com/adsk/index/0,,837403-123112,00.html

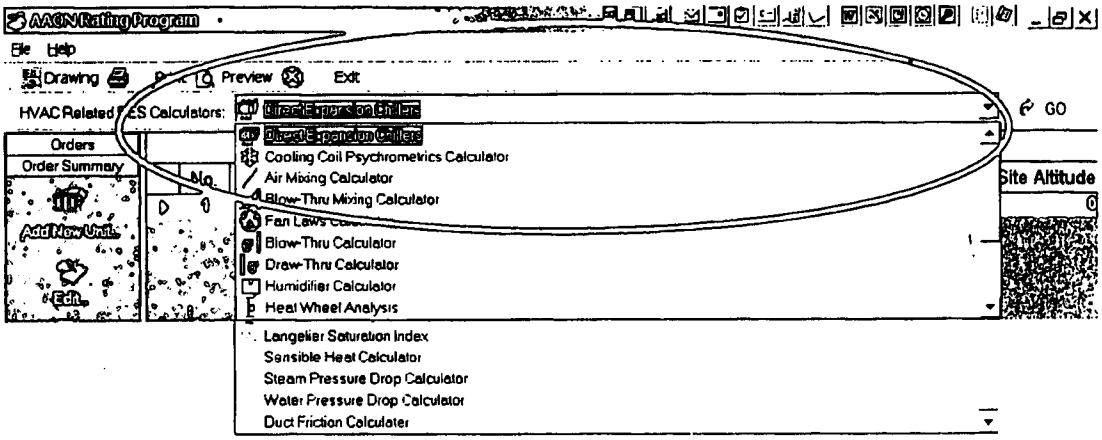
7. PRINTING REPORTS:

To print reports click, [PRINT]. Reports may be viewed on the screen and or printed.

How To Create An RL Unit Selection

8. Engineering Calculation Aides

Along the top of the main program screen are a series of icons.



These are engineering programs that perform the following functions:

1. Direct Expansion Chiller is a preliminary rating program for air-cooled and evaporative-cooled DX chillers from 35 to 365 tons.
2. Cooling Coil Psychrometrics Calculator determines the cooling coil load based on entering/leaving conditions, cfm at any altitude.
2. Mixing – Adiabatic mixing of two air streams
3. BT Mixing – Determines mixed air condition if coil entering conditions and fan power are known.
4. Fan Law – Fan Law calculator.
5. Blow Thru – Blow through fan system psychrometrics.
6. Draw Thru – Draw through fan system psychrometrics.
7. Humidifier – Analysis of steam and evaporative humidifiers
8. Heat Wheel Analysis – Heat wheel performance calculator
9. LSI – Calculation of Langelier Saturation Index and tendency to form scale
10. Water Piping Pressure Drop
11. Steam Piping Pressure Drop
12. Duct Friction calculator
13. Sensible Heat Calculator 1
14. Sensible Heat Calculator 2

Click the icons and check them out. In all cases inputs variables are in boxes.

Division 15 Specifications

SECTION 15782 - ROOFTOP UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes rooftop heating and cooling units.

B. Related Sections include the following:

1. Division 7 Section "Manufactured Roof Specialties" for type and style of roof curbs and equipment supports.

2. Division 15 Section "Mechanical Vibration Controls and Seismic Restraints" for manufactured isolation bases.

3. Division 15 Section "Control Systems Equipment" for temperature-control devices, and control wiring and control devices connected to energy recovery units.

1.03 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities of selected model clearly indicated; dimensions; required clearances; shipping, installed, and operating weights; furnished specialties; accessories; and installation and startup instructions.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

C. Commissioning Reports: Indicate results of startup and testing commissioning requirements. Submit copies of checklists.

D. Maintenance Data: Maintenance manuals specified in Division 1.

E. Warranties: Special warranties specified in this Section.

1.04 QUALITY ASSURANCE

A. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

B. B. Energy Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

C. Listing and Labeling: Provide electrically operated components specified in this Section that are listed and labeled.

1. The rooftop unit(s) shall be certified in accordance with UL Standard 1995 and ANSI Standard Z21.47

2. The rooftop unit(s) shall be safety certified by an accredited testing laboratory and the nameplate shall carry the label of the certification agency.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver rooftop units as factory-assembled units with protective crating and covering as recommended by the manufacturer.

B. Coordinate delivery of units in sufficient time to allow movement into building.

C. Handle rooftop units to comply with manufacturer's written rigging and installation instructions for unloading and moving to final location.

1.06 COORDINATION

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations with roof construction. Roof specialties are specified in Division 7 Sections.

1.07 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: A written warranty, executed by the manufacturer and signed by the Contractor, agreeing to replace components that fail in materials or workmanship, within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed.

1. Warranty Period, Compressors: Manufacturers standard, but not less than 5 years after date of startup but not to exceed 5 years from shipment.

2. Warranty Period, Heat Exchangers: Manufacturers non- prorated full parts replacement not less than 15 years after date of startup or 15 years from date of shipment.

1.08 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Filters: One set of filters for each unit.

Division 15 Specifications

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to strict compliance with the requirements of this specification, provide products by one of the following:

1. Rooftop Units:

a. AAON, Inc.

2.02 ROOFTOP UNITS (RTU-)

A. Description: Factory assembled and tested; designed for roof or slab installation; and consisting of compressors, condensers, evaporator coils, condenser and evaporator fans, refrigeration and temperature controls, gas heater, (hot water coils), (glycol coils), (chilled water coils), (steam coils), filters, and dampers.

B. Construction:

1. Unit shall be completely factory assembled, piped and wired and shipped in one (two) section(s).
2. Unit shall be specifically designed for outdoor roof top application with a fully weatherproof cabinet.
3. Cabinet shall be constructed entirely of G90 galvanized steel with the exterior constructed of 18 gauge or heavier material.
4. Paint finish shall be capable of withstanding at least 2000 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
5. The unit roof shall be sloped to assure drainage.
6. A walk-in compartment shall contain the compressors and electrical control panel. The compartment shall be provided with a fluorescent light fixture with a wire guard. The light shall be controlled by a wall switch and shall remain energized regardless of the position of the main power switch.
7. Unit specific color coded wiring diagrams shall match the unit color coded wiring and will be provided in both point-to-point and ladder form.
8. Diagrams shall also be laminated in plastic and permanently affixed inside the control compartment.
9. Access to filters, blower, heating section, and other items needing periodic checking or maintenance shall be through hinged access doors with latches which are operable from both sides and have provisions for a padlock.
10. Access doors shall have stainless steel hinges and full perimeter gasketing and open against air pressure.
11. Air side service access doors shall have rain gutters over the door.
12. All access doors will have an internal metal liner to protect the door insulation.
13. The interior air side of the cabinet shall be entirely insulated on all exterior panels with 2 inch thick, 1 1/2 lb. density fiberglass insulation covered with a metal liner.
14. Unit shall have decals and tags to indicate unit lifting and rigging, service areas and caution areas. Installation and maintenance manuals shall be supplied with each unit.

CL 631

Cabinet options include:

a. (Unit exterior to be "Grey" in color.)
b. (Unit exterior to be "Tan" in color.)
c. (Unit shall be furnished with 304 stainless steel drain pans.
d. (Unit shall be furnished from the manufacturer with marine service lights in each air stream compartment. All lights in the air stream shall be incandescent, vapor proof fixtures with a cast alloy base with threaded hubs, glass cover and gasket and a wire guard. All lights shall be controlled from the light switch in the compressor / control compartment.)
e. (Unit shall be furnished from the manufacturer with windows on all the access doors.)
f. (Unit shall be furnished from the manufacturer with burglar bars on the supply and return air duct connection areas.)
g. (Unit base shall be insulated with 2 inch thick, 1 1/2 lb density fiberglass insulation.)
h. (Perforated liner in discharge and return sections)

C. Supply Fans:

The fan shall be direct drive single width single inlet un-housed single thickness airfoil centrifugal, plenum fans. Supply fans shall have all aluminum construction and rated class II. Fans attached to 1760 rpm motors shall be rated for a minimum of 1800 RPM maximum speed. Fans attached to 1170 rpm motors shall be rated for a minimum of 1200 RPM maximum speed. Direct drive fans shall be directly connected to and supported by the motor shaft. Motor bearings shall be rated for 200,000 hours service and shall have external lubrication connections. Fan(s) and motor(s) shall be dynamically balanced, and the entire fan assembly mounted on spring isolators. Supply air shall be from the (bottom), (top), or (side) of the cabinet. (For Variable Volume Systems VFD drive(s) shall be factory mounted and wired to the fan motor(s).)

D. Outside Air Options: (Select One)

1. Shall be 0-25% with a manually adjustable damper.
2. Shall be 100% outside air with no return air or damper assembly.
3. Shall be 0-50% with an adjustable, motor operated outside air damper assembly constructed of extruded aluminum, hollow core, air foil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 25 CFM of leakage per sq. ft. of damper area when subjected to 2 in. w.g. air pressure differential across the damper. Damper motor shall be spring return to ensure closing of outdoor air damper during periods of unit shut down or power failure.
4. Shall be 0 - 100% with a motor operated outside air damper assembly constructed of extruded aluminum, hollow core, air foil blade with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 25 CFM of leakage per sq. ft. of damper area when subjected to 2 in. w.g. air pressure differential across the damper. Damper motor shall be spring return to ensure closing of outdoor air damper during periods of unit shut down or power failure. No return air connection shall be present.
5. Shall be 2 position dry bulb activated economizer with multistage

Damper blades shall be gear driven and designed to have no more than 25 CFM of leakage per sq. ft. of damper area when subjected to 2 in. w.g. air pressure differential across the damper. Damper motor shall be spring return to ensure closing of outdoor air damper during periods of unit shut down or power failure.

6. Shall be 3-position, enthalpy activated economizer with multistage integrated economizer and compressor operation controlled by the conditioned space controller for maximum benefit. The economizer shall consist of a motor operated outdoor air damper and return air damper assembly constructed of extruded aluminum, hollow core, air foil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 25 CFM of leakage per sq. ft. of damper area when subjected to 2 in. w.g. air pressure differential across the damper. Damper motor shall be spring return to ensure closing of outdoor air damper during periods of unit shut down or power failure.
7. Shall be a fully modulating, enthalpy controlled economizer with multistage integrated economizer and compressor operation for maximum benefit. The economizer shall consist of a motor operated outdoor air damper and return air damper assembly constructed of extruded aluminum, hollow core, air foil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 25 CFM of leakage per sq. ft. of damper area when subjected to 2 in. w.g. air pressure differential across the damper. Damper motor shall be spring return to ensure closing of outdoor air damper during periods of unit shut down or power failure.
8. Shall be a fully modulating economizer for control by others with a DDC signal. The outside air damper and return air damper assembly shall be constructed of extruded aluminum, hollow core, air foil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 25 CFM of leakage per sq. ft. of damper area when subjected to 2 in. w.g. air pressure differential across the damper. Damper motor shall be spring return to ensure closing of outdoor air damper during periods of unit shut down or power failure.

E. Optional Exhaust/Relief Fans:

Axial flow direct drive 1170 RPM fans shall have all aluminum construction and adjustable blade pitch. Direct drive fans shall be directly connected to and supported by the motor shaft. Motor bearings shall be rated for 200,000 hours service and shall have external lubrication connections. Fan(s) and motor(s) shall be dynamically balanced. Exhaust air relief dampers shall be sized for 100% relief, and shall be provided as part of the power return/exhaust option. (For Variable Volume Systems VFD drive(s) shall be factory mounted and wired to the fan motor(s).)

1. Optional Non-Powered Return/Exhaust Section:
   a. A non-powered return / exhaust section shall be supplied for return duct connection. This section shall be designed to handle the full airflow requirements of the economizer operation.
   b. Exhaust air relief damper shall be provided as part of the non-powered return / exhaust section.
   c. (Note that other means for building pressure control must be provided when non-powered return is selected).

F. Optional Energy Recovery:

1. The rooftop unit shall have a factory mounted and tested energy recovery wheel. The energy recovery wheel shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seals and bearings.
2. The energy recovery cassette shall be rated in accordance with ARI Standard 1060 and shall bear the ARI certification symbol.
3. The energy recovery cassette shall contain a total energy recovery heat wheel constructed of a light weight polymer material with permanently bonded desiccant coating. The energy recovery wheel media shall be capable of removal from the cassette and replacement without the use of tools. Wheel media shall be cleanable using hot water or light detergent without degrading the latent efficiency.
4. The exhaust fan shall be axial flow type, directly driven by the motor. Fan(s) and motor(s) shall be dynamically balanced. A back draft damper shall be included with the exhaust fan. Outside air filters shall be 4 inch, pleated, disposable.

F. Motors shall be premium efficiency (standard efficiency) as manufactured by Baldor, Toshiba, or Reliance. Motors for use with VFD shall be premium efficiency inverter rated only. Motor bearings shall be ball bearing and shall have external lubrication connections.

G. Condenser Options: (Select One)

1. Air Cooled Condenser Section:
   a. The condenser coils, facing out, shall be protected by a sheet of perforated metal.
   b. The condensing section shall be equipped vertical discharge axial flow direct drive 1170 RPM fans with all aluminum construction and adjustable blade pitch. Direct drive fans shall be directly connected to and supported by the motor shaft. Motor bearings have external lubrication connections.
   c. The condenser coils shall be sloped to protect the coils from damage.
   d. Condenser coils shall be copper tubes with aluminum fins mechanically bonded to the tubes.
   e. Condenser coils to be sized for a minimum of 10°F of refrigerant sub-cooling.
   f. To conserve energy, condenser fans shall be cycled off when not required based on outdoor temperature.
      Options:
      1. Condenser coils shall be copper tubes with aluminum fins mechanically bonded to the tubes and with a baked-on phenolic corrosion resistant coating.

2. Evaporative Condenser Section:
   a. The evaporative condensing section shall be of draw-through arrangement. The section shall be fully integrated and furnished with the remainder of the air handling section. Condenser coil tubing shall be a multiple pass design with copper tubes retained in place with non-metallic tube sheets to allow expansion and contraction of the tubing and to prevent corrosion due to dissimilar metal contact.
   b. A separate condenser coil assembly shall be provided for each compressor and the assembly shall be mounted on stainless steel slide rails.
   c. The condensing section shall also contain a separate coil on the air leaving side of the eliminator for de-superheating of compressor discharge gas.

d. The mechanical refrigerant system shall be capable of operation down to an ambient of 35°F.
e. Condenser fans shall be vertical discharge and direct drive, propeller type of aluminum construction.
f. Fan motors shall be three-phase, 1170 RPM, ODP and shall be wired using weatherproof Sealtite conduit connectors. Condenser fan motors shall be controlled by a VFD varying speed based on sump water temperature.
g. The evaporative condenser water circuiting shall be factory installed and include:
    1. 304 series stainless steel construction of the sump and interior walls. All structural elements shall be 304 stainless steel.
    2. Close coupled end suction water circulating pump, with ODP motor.
    3. Water level control
    4. Non-corrosive water spray piping and nozzles shall be easily removable.
    5. Positive shutoff of the water fill supply with a solenoid valve
    6. Field adjustable bleed valve for the sump water
    7. Manually operated gate valve for drainage of the sump
    8. Double sided stainless steel doors and casing shall provide access on each side of the unit to the sump, coils, spray nozzles and eliminators
    9. A sump water treatment system shall be furnished containing a monitor and control for dissolved solids, organic dispersal and biocide, including a dispenser for each. The system shall also contain a controller for the blow down cycle and the injector pumps for all three chemicals, as well as, the containers for each of the three chemicals that are provided by others.
    10. (Optional electric sump immersion heater with thermostat and low water level safety switch.)
    11. (Optional heat tracing of all water piping below the sump water level.)
h. The evaporation rate shall not exceed 80% of the total heat of rejection based on a heat of vaporization of water of 1000 Btu/lb.

3. Water Cooled Condenser Section
    a. The water cooled condensing section shall contain plate type heat exchangers. They shall be circuited in a counter flow arrangement to the refrigerant system. Each heat exchanger shall be provided with a removable and cleanable type basket filter on the waterside circuit. Field piping connections shall be made at each plate heat exchanger within the condensing section of the rooftop unit.

    Options:
    1. Each heat exchanger circuit shall have a factory installed water balancing valve.
    2. Each heat exchanger circuit shall have a factory installed motorized shutoff valve. The individual valves shall be energized with operation of each corresponding refrigerant circuit.
    3. Each heat exchanger shall have a factory installed compressor head pressure control.
    4. All water circuits shall be connected to a manifold to allow a single supply and return field connection to be made within the condensing section of the rooftop unit.
    5. Shell and tube heat exchangers.
    6. Insulated condensing section.
    7. Thermostatically controlled electric heater in condensing section for freeze protection only.

F. Filters: 2-inch- thick, fiberglass, pleated with an ASHRAE efficiency of 30%. Maximum face velocity shall be 500 fpm.

Optional filters include:

1. (4" thick fiberglass pleated with an ASHRAE efficiency of 30%)
2. (2" thick permanent filter.)
3. (2" or 4" 30% efficient pre-filters with 65%, 85%, or 95% 12 inch pleated cartridge final filters.)
4. (2" or 4" 30% efficient pre-filters with 65%, 85%, or 95% 30 inch bag final filters.)
5. (Clogged filter switch)
6. (Direct dial reading Magnehelic gauge mounted in the control compartment.
7. (65%, 85%, or 95% 12 inch pleated cartridge or 30 inch bag final filters located at the unit discharge.)

G. Evaporator Coils:

1. Evaporator coils shall be copper tube with aluminum fins mechanically bonded to the tubes.
2. Evaporator coils shall be rated in accordance with ARI Standard 410.
3. Evaporator coils shall have galvanized steel end casings.
4. Evaporator coils shall have equalizing type vertical tube headers.
5. Evaporator coils shall be furnished with a thermostatic expansion valve.
6. Evaporator coils with a finned width greater than 47.5 inches shall have an intermediate condensate pan with drain line installed.
7. Evaporator coils shall be furnished with a double sloped drain pan for the positive drainage of condensate.
8. A drain connection shall be provided on each side of the unit. The manufacturer shall provide a P-trap condensate drain fitting for field installation to the drain connections.

Options:

a. Evaporator coil drain pan(s) shall be fabricated from 304 stainless steel.
b. Evaporator coil(s) shall have 304 stainless steel casings.
c. Evaporator coil(s) shall be phenolic coated.

H. Refrigeration System:

1. Compressors shall be scroll type tandem arrangement with internal thermal overload protection and mounted on the compressor manufacturer's recommended rubber vibration isolators. Each pair of tandem compressors shall have independent refrigerant circuits.
2. All units shall be multiple stages with a minimum of 2 stages of capacity control.
3. Compressors shall be mounted in an isolated walk-in compartment to permit operation of the unit without affecting air flow when the door to the compartment is open.
4. Compressors shall be isolated from the base pan and supply air to avoid any transmission of noise from the compressor into the building area.
5. System shall be equipped with thermostatic expansion valve type refrigerant flow control.
6. System shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant controls.
7. Unit shall be equipped with Schrader type service fittings on both the high side and low pressure sides of the system.
8. Unit shall be equipped with replaceable core refrigerant liquid line driers with isolation valves.
9. Unit shall be fully factory charged with refrigerant.

Options: (Multiple selections are permissible)

a. Hot gas bypass shall be provided on the first (lead) refrigerant circuit.

b. Hot gas bypass shall be provided on all refrigerant circuits.
c. Each compressor shall be individually staged for capacity control.
d. All circuits shall be equipped with liquid line sight glasses.
e. Unit shall be provided with a hot gas reheat coil piped to the lead refrigerant system. (with modulating hot gas control)
f. Unit shall be provided with a hot gas reclaim coil for field piping to another refrigerant system.
g. Unit shall be equipped with a 5 minute anti-short cycle delay timer for each stage.
h. Unit shall be equipped with 20 second between stage delay timers for each stage.
i. First stage cooling shall be provided to allow operation in low ambient to 0°F.
j. Each compressor shall be equipped with suction and discharge service valves.

I. Gas Heat Section:

1. Unit shall heat using natural gas fuel and with a minimum two stages of heat capacity.
2. Unit shall be provided with a gas heating furnace(s) consisting of a stainless steel heat exchanger with multiple concavities, an induced draft blower and an electric pressure switch to lockout the gas valve until the combustion chamber is purged and combustion air flow is established. Drum type heat exchangers or heat exchanger tubes with separate internal turbulators are not acceptable.
3. Unit shall be provided with a gas ignition system consisting of an electronic ignitor to a pilot system, which will be continuous when the heater is operating, but will shut off the pilot when heating is not required.
4. Unit shall be equipped with redundant gas valves and high limit cut-out.
5. Unit shall have gas supply piping entrances in the unit base for through the curb gas piping and in the outside cabinet wall for across the roof gas piping.
6. The gas heat exchanger shall carry a 15 year non pro-rated warranty.

OPTIONS:

a. Unit shall heat using natural gas fuel and with four stages of heat capacity.
b. Unit shall heat using natural gas fuel and with eight stages of heat capacity.
c. Unit shall heat using natural gas fuel and with 12 stages of heat capacity.

J. Electric Heat Section:

1. Unit shall include an electric heating section complete with fuses, and a resetable high temperature limit switch. Heaters shall be provided in 40 kW sections with two 20 kW stages of heat each.

K. Hot Water Coils

1. Unit shall be provided with a (1) or (2) row hot water heating coil, with copper tube and aluminum fins mechanically bonded to the tubes.

Options:

a. Unit shall be provided with a (1) or (2) row hot water heating coil, with copper tube and aluminum fins mechanically bonded to the tubes and with a baked-on phenolic corrosion resistant coating.

b. Unit shall be provided with a (1) or (2) row hot water coil in the preheat position, 5/8" copper tube with aluminum fins mechanically bonded to the tubes.

L. STEAM COIL

1. Unit shall be provided with a (1) or (2) row tube-in-tube steam coil, 5/8" copper tube with aluminum fins mechanically bonded to the tubes.

Options:

a. Unit shall be provided with a (1) or (2) row tube-in-tube steam coil, 5/8" copper tube with aluminum fins mechanically bonded to the tubes and with a baked-on phenolic corrosion resistant coating.

b. Unit shall be provided with a (1) or (2) row tube-in-tube steam coil in the preheat position, 5/8" copper tube with aluminum fins mechanically bonded to the tubes.

M. Controls (Select One):

1. Standard Mechanical Controls

2. W973 Honeywell Controller

Includes Honeywell W973 logic panel and includes the T7067 thermostat and Q667B sub-base. The logic panel is factory mounted and wired in the unit controls cabinet, and can control up to six stages of heating or cooling.

3. W7100 Honeywell Controller

Includes Honeywell W7100 discharge air temperature controller factory mounted and wired in the unit controls cabinet.

4. W7100 Controller + Expansion Board

Includes Honeywell W7100 discharge air temperature controller factory mounted and wired in the unit controls cabinet.

5. VAV Unit Controller

a. The unit shall include a programmable controller which provides 7 day, 2 events per day scheduler, 14 day holiday schedule, optimal start and outputs for heating, cooling, and economizer and supply air volume. Factory mounted and wired are the return and outside air temperature sensors. Furnished with the unit for customer installation are the zone temperature sensor and supply air duct temperature sensor.

b. Control of supply air flow modulation shall be by factory installed VFD blower speed controller, controlled by a factory installed system pressure controller and a field installed duct static pressure sensing device.

c. Controller shall be multistage and include compressor anti-short cycle protection for each compressor.

Options: (Multiple selections are permissible)

1. Unit shall be equipped with hot gas by-pass control on the lead refrigeration stage to protect against evaporator frosting at low air flows and suction pressures.
2. Unit shall be equipped with morning warm up thermostat controller.
3. Unit shall be equipped with morning warm up thermostat controller and a night set back temperature controller with a cooling lock-out function.

6. Constant Volume Unit Controller
    a. CAV programmable controller shall be internal to the rooftop unit and shall include a 7 day, 2 events per day scheduler, 14 day holiday schedule, optimal start and outputs for heating, cooling, economizer. The outside air temperature and the humidity sensors shall be factory mounted. The unit manufacturer shall provide the supply air temperature sensor for field installation by others.

7. Make Up Air Unit Controller
    a. MUA programmable controller shall be internal to the rooftop unit and shall include a 7 day, 2 events per day scheduler, 14 day holiday schedule, optimal start and outputs for heating, cooling, economizer. The outside air temperature and the humidity sensors shall be factory mounted. The unit manufacturer shall provide the supply air temperature sensor for field installation by others.

8. Heat Cool Changeover Controller

9. Field Installed DDC Controls by Others

10. Factory mounted and wired DDC Controls by Others

N. SMOKE DETECTOR
    1. Unit shall be provided with a smoke detector(s) sensing in the: (A) return air; (B) supply air; or (C) both the return & supply air portion of the unit wired to: (a) shut off the supply fan; or (b) shut off the unit control circuit.

O. FIRESTAT
    1. Unit shall be provided with a firestat(s) sensing in the: (A) return air; (B) supply air; or (C) both the return & supply air portion of the unit wired to: (a) shut off the supply fan; or (b) shut off the unit control circuit.

P. POWER OPTION: (Multiple selections are permissible)
    1. Unit shall be provided with a factory installed and wired internal disconnect.
    2. Unit shall be provided with phase and brown-out protection to shut down all motors in the unit if the phases are more than 10% out of balance on voltage, or the voltage is more than 10% under design voltage or on phase reversal.
    3. Unit shall be provided with a factory installed and wired 115 volt, 15 amp ground fault service receptacle.
    4. Unit shall be provided with a factory installed and field wired 115 volt, 15 amp ground fault service receptacle.

2.05 ROOF CURBS

A. Unit shall be mounted on a factory furnished, knocked down and field assembled roof curb. Roof curbs shall be constructed of galvanized steel with a wood nailer strip. Curbs are to be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support and air seal for the unit.

Sample Output Reports - Index

REPORT NOTES

All of the above output reports from the AAON ECat Rating program are typical of what is available for the specific application conditions and feature specifications of a job.

All of the output reports shoud be printed out after all the conditions and model features have been made and reviewed on screen for acceptability.

When making revisions at a later time due to job design and/or specification changes, it must be remembered that there may be far reaching effects in many areas. Be sure to print out all the outputs for all the differences.

AAON, Inc. — Unit Rating

2425 South Yukon Ave - Tulsa, OKlahoma 74107-2728 - Ph. (918) 583-2266 Fax (918) 583-6094

AAONEcat32 Ver. 4.07 Beta

1A	1B	1C	1D	2	3	4	5A	5B	5C	6A	6B	6C	7	8	9	10	11	12	13	14A	14B	15	16	17	18	19	20	21	22	23
R	L	-	2	3	0	-	3	-	0	-	0	F	0	8	-	2	3	1	:	G	G	D	K	-	D	0	0	-	Q	B	1	-	0	0	0	-	0	A	0	0	0	0	0	-	0	0	-	0	0	0	0	0	A	A	0	B

Tag: RTU# 1

Job Information

Job Name:	*Engineering Manual*
Job Number:	*Sample Job*
Site Altitude:	*0 ft*

Unit Information

Approx. Op./Ship Weights:	*44532 / 38032 lbs.*
Supply CFM/ESP:	*60000 / 2 in. wg.*
Pre-Filter FV / Qty:	*360.00 fpm / 60*
Exhaust CFM/ESP/TSP:	*60000 / 0.75 / 1.99 in. wg.*
Outside CFM:	*25000*
Ambient Temperature:	*95 °F DB / 75 °F WB*
Return Temperature:	*75 °F DB / 62 °F WB*

Static Pressure

External:	*2.00 in. wg.*
Evaporator:	*0.70 in. wg.*
Filters Clean:	*0.15 in. wg.*
Dirt Allowance	*0.35 in. wg.*
Economizer:	*0.23 in. wg.*
Heating:	*0.15 in. wg.*
Cabinet:	*0.68 in. wg.*
Heatwheel:	*0.88 in. wg.*
Total:	*5.13 in. wg.*

Cooling Section

	Gross	Net
Total Capacity:	*2431.11*	*2233.60 MBH*
Sensible Capacity:	*1909.37*	*1711.87 MBH*
Latent Capacity:	*521.73 MBH*	
HW Total Cooling Capacity:	*757.30 MBH*	
Mixed Air Temp:	*77.59 °F DB*	*64.15 °F WB*
Entering Air Temp:	*80.62 °F DB*	*65.15 °F WB*
Lv Air Temp (Coil):	*51.40 °F DB*	*51.20 °F WB*
Lv Air Temp (Unit)	*51.40 °F DB*	*51.20 °F WB*
Supply Air Fan:	*BT - 4 x 300 @ 18.26 BHP Ea.*	
SA Fan RPM / Width:	*1526 / 6.810"*	
Exhaust Air Fan:	*2 x MW4816-40 @ 20.81 BHP Ea.*	
EA Fan RPM / Pitch:	*1129 / 40°*	
Evaporator Coil:	*125.9 ft² / 6 Rows / 12 FPI*	
Evaporator Face Velocity:	*476.7 fpm*	
Energy Recovery Wheel:	*2 x ERC-81146*	

Heating Section

PreHeat Type:	*Std (No Preheat)*
Heating Type:	*Nat. Gas Heat*
Total Capacity:	*1332.0 MBH*
OA Temp:	*10.0 DB / 9.0°F WB*
RA Temp:	*75.0 °F DB / 62.0 °F WB*
Entering Air Temp:	*60.0 °F DB / 45.0 °F WB*
Leaving Air Temp:	*80.6 °F DB / 54.1 °F WB*
Input:	*1617.4 MBH*
Heater Qty (Hi/Low):	*5 / 1*
Consumption:	*1617.4 MBH*
Operation:	*Single Bank*

EER - ARI Listing Information

No ARI Rating Program Exists for Units Over 250 MBH
All AAON Units Are Tested in Accordance With ARI Standards

EER @ ARI Conditions:	*11.8*	**EER Compressor Only @ ARI Conditions:**	*15.1*
Application EER @ Op. Conditions:	*11.2*	**Condensing Unit EER @ Op. Conditions:**	*13.9*

Electrical Data

Rating:	*460/3/60*	Minimum Circuit Amp:	*509*
Unit FLA:	*501*	Maximum Overcurrent:	*600*

Motors

	Qty	HP	VAC	Phase	RPM	FLA	RLA
Compressor 1:	8		460	3			33.1
Condenser Fans:	4	3.00	460	3	1170	4.8	
Condenser Pump:	1	7.50	460	3	1760	11.0	
Supply Fan:	4	25.00	460	3	1760	34.0	
Exhaust Fan:	2	25.00	460	3	1170	34.0	
Combustion:	2	0.25	230	1	3200	1.3	
Heatwheel:	2	0.25	460	3	1760	0.8	

Cabinet Sound Power Levels*

Octave Bands:	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Discharge LW(dB):	89	92	99	95	90	80	73	59
Return LW(dB):	99	102	103	94	97	97	93	89

AAON,Inc. Energy Wheel Rating

2425 South Yukon Ave - Tulsa, Oklahoma 74107-2728 - Ph. (918) 583-2266 Fax (918) 583-6094

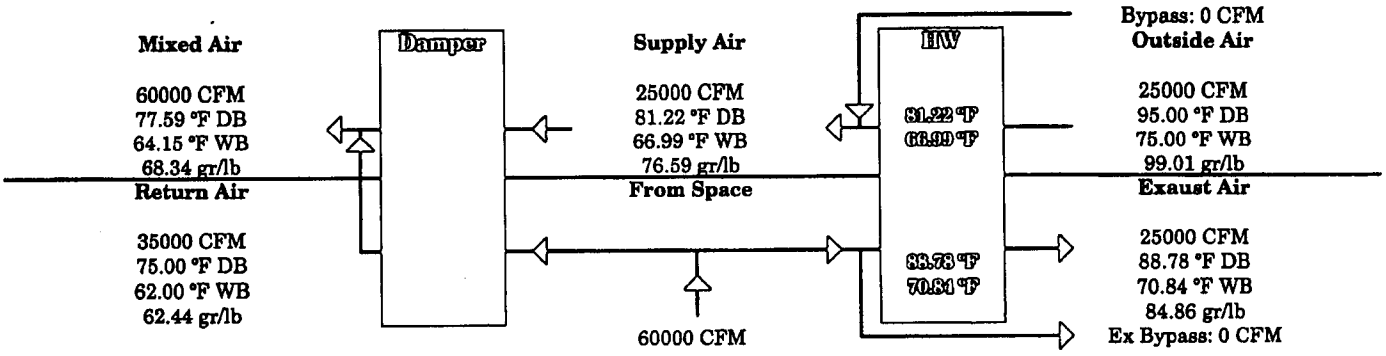
AAONEcat32 Ver. 4.07 Beta

1A	1B	1C	1D	2	3	4	5A	5B	5C	6A	6B	6C	7	8	9	10	11	12	13	14A	14B	15	16	17	18	19	20	21	22	23
R	L	-	2	3	0	-	3	-	0	-	0	F	0	8	-	2	3	1	:	G	G	D	K	-	D	0	0	-	Q	B	1	-	0	0	0	-	0	A	0	0	0	0	0	-	0	0	-	0	0	0	0	0	A	A	0	B

Tag: RTU# 1

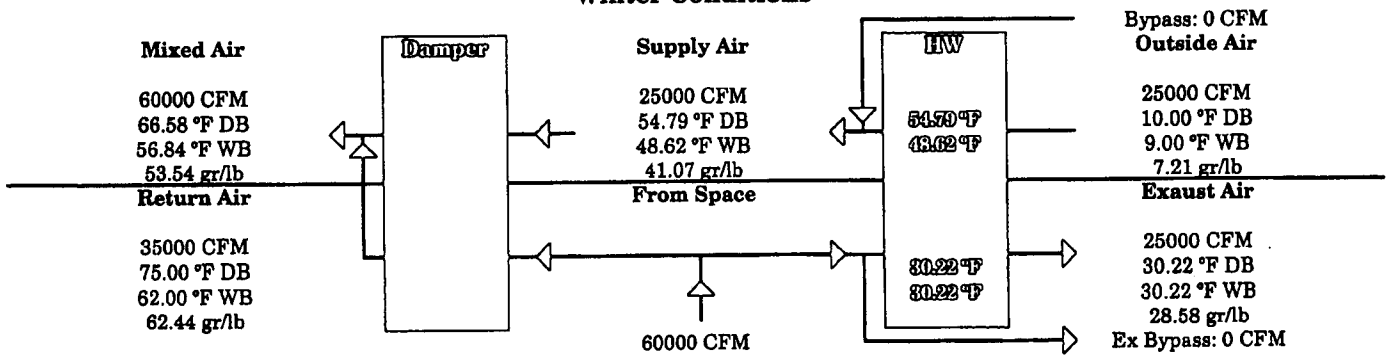
Job Name	**Engineering Manual**	Heat Wheel Type:	**Total**
Job Number	**Sample Job**	Heat Wheel Model:	**ERC-81146**
Site Altitude	**0'**	Heat Wheel Qty:	**2**

Summer Conditions



Cooling/Dehumidification		Heating/Humidification
Total Capacity:	**757.30 MBH**	**0.00 MBH**
Sensible Capacity:	**374.51 MBH**	**0.00 MBH**
Latent Capacity:	**382.79 MBH**	**0.00 MBH**

Winter Conditions



Cooling/Dehumidification		Heating/Humidification
Total Capacity:	**0.00 MBH**	**1777.70 MBH**
Sensible Capacity:	**0.00 MBH**	**1197.15 MBH**
Latent Capacity:	**0.00 MBH**	**580.55 MBH**

CL 642

AAON,Inc. Submittal

2425 South Yukon Ave - Tulsa, Oklahoma 74107-2728 - Ph. (918) 583-2266 Fax (918) 583-6094

AAONEcat32 Ver. 4.07 Beta

			1A	1B	1C	1D	2	3	4	5A	5B	5C	6A	6B	6C	7	8	9	10	11	12	13	14A	14B	15	16	17	18	19	20	21	22	23
RL	-	**230**	-	**3**	-	**0**	-	**0F**	**08**	-	**231**	:	**GGDK**	-	**D00**	-	**QB1**	-	**000**	-	**0A**	**00000**	-	**00**	-	**00000**	**AA**	**0B**					

Tag: RTU# 1

Job Name: *Engineering Manual*
Job Number: *Sample Job*
Submittal For:
Submittal Date: *February 07, 2002*

	Base Option	Description
R	Series	Roof Top Unit
L	Generation	Eights Generation
230	Size	Two Hundred and Thirty
3	Voltage	460V/3Ø/60Hz
0	Interior Protection	Standard
0	Cooling Style	Blow Thru - R22 Dual Circuited Compressors
F	Cooling Configuration	Evap Cond w/ 6R Coil High CFM
0	Cooling Coating	Std
8	Cooling Stages	8 Stage
2	Heating Type	Nat. Gas Single Rack (SR)
3	Heating Designation	Heat 3 - 6 Heaters
1	Heating Stages	2 Stage

	Feature Option	Description
G	1A.Outside Air Options	Heat Wheel Extra Large (2-81 inch wheel)
G	1B.RA Blower Configuration	2 Blowers (Prem eff mtr)w/ 2-motors 2-VFD
D	1C.RA Blower	Blower D (48" Dia 16 Blade)
K	1D.RA Motor	25 hp (1170 rpm)
D	2.Outside Air Controls	Full Mod Enthalpy Econ
0	3.Discharge Location	Bottom Discharge
0	4.Return Location	Bottom Return
Q	5A.SA Blower Configuration	4 Blowers w/(Prem eff mtr) w/4-VFD's
B	5B.SA Blower	Blower B (30" Diameter)
1	5C.SA Motor	25.0 hp (1760 rpm)
0	6A.Pre-Filter	2" Pleated
0	6B.Final Filter	Std
0	6C.Filter Options	Std
0	7.Refrigeration Controls	Std
A	8.Refrigeration Options	Hot Gas Bypass Lead Stage [HGB]
0	9.Refrigeration Accessories	Std
0	10.Power Options	Std Power Block
0	11.Safety options	Std
0	12.Controls	Std
0	13.Special Controls	Std
0	14A.Pre-Heat Configuration	Std (No Preheat)
0	14B.Pre-Heat Sizing	Std (No Preheat)
0	15.Option Boxes	Std
0	16.Cabinet Options	Std
0	17.Cabinet Options	Std
0	18.Customer Code	Std
0	19.Code Options	Std ETL USA Listing
A	20.Unit Splits	Two Piece Unit (Split After Evap Coil)
A	21.Evap & Water Condenser	Basic Package (Evap Cond or Water Cooled)
0	22.Blank	Std
B	23.Type	Std (Includes 'Gray Paint')

AAON Incorporated

4209-40 Axial Fan

JOB INFORMATION:

Job Name:	
Job Tag:	
Rep Firm:	
Date:	*12/07/2001*

OPERATING CONDITIONS:

Air Flow:	*60,000 CFM*
Static Pressure:	*1.63 in. Wg.*
Plenum DP:	*0.00 in. Wg.*
Inlet Grill DP:	*0.00 in. Wg.*
TSP:	*1.63 in. Wg.*
Site Altitude:	*0.00 Ft*
TSP @ Sea Level:	*1.63 in. Wg.*

FAN PERFORMANCE:

RPM:	*1471*
BHP:	*19.87*
Efficiency:	*47.3%*
In/Out Velocity:	*1265/1464 FPM*
Plenum Out Velocity:	*678 FPM*

WHEEL SPECIFICATION:

Max RPM:	*1,501*
Diameter x Qty:	*42.0 in. x 2*
Width:	*100%*
Tip Speed:	*16,174 FPM*
Shaft/Bearing Dia.:	*3 15/16" / 2 11/16"*
Inertia:	*872 WR²*

MOTOR SELECTION:

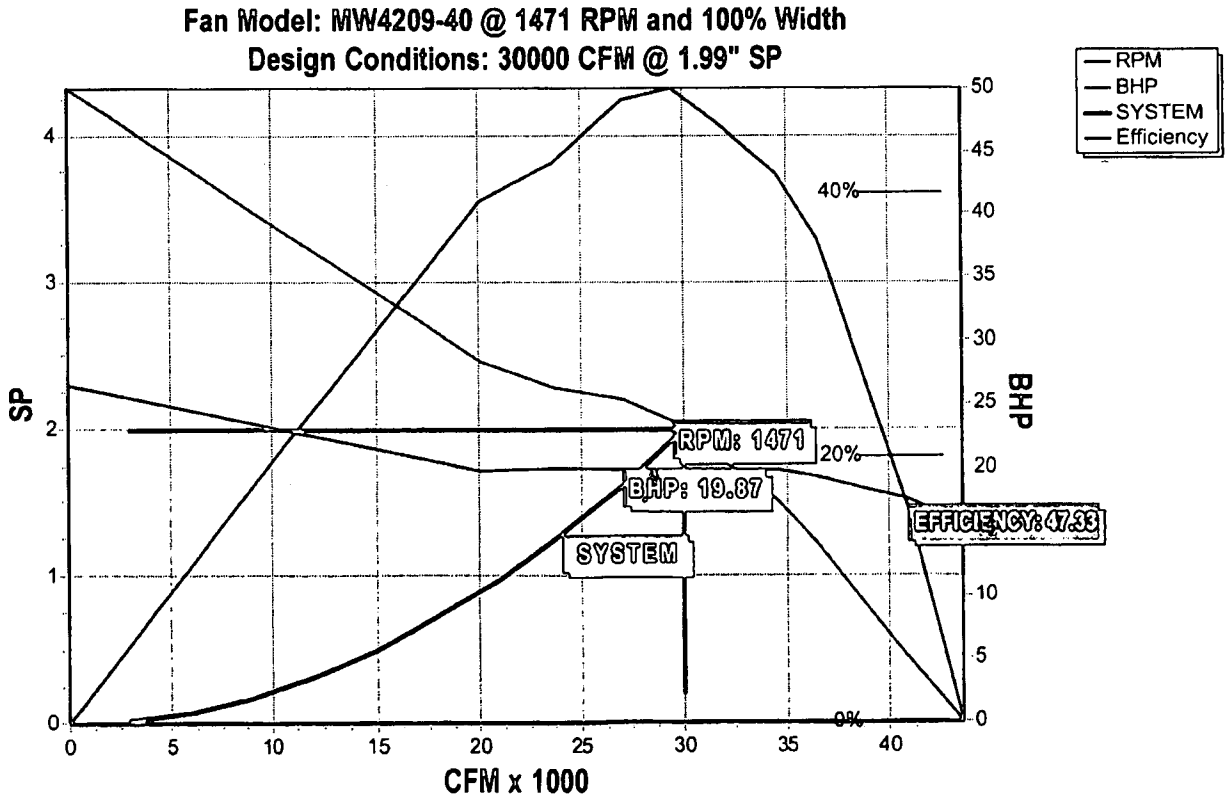
Rated HP / Bypass:	*25 x 2 / No*
Frame Size:	*0.941*
Nominal RPM:	*1760*
VAC/PH/HZ:	*460/3/60*
Efficiency	*Premuim*
Enclosure Type:	*ODP*
Max Inertial Load:	*284T*

FAN SOUND POWER x 2 Fans (In/Out):

Octave Band: **(Re 10^-12 watts)**

1	2	3	4	5	6	7	8
100	*105*	*105*	*103*	*101*	*99*	*96*	*93*
100	*105*	*105*	*103*	*101*	*99*	*96*	*93*

SOUND POWER A-Weighted: **105 / 105 dB**



CL 644

AAON Incorporated

30.0" STAR Plenum

JOB INFORMATION:

Job Name:	
Job Tag:	
Rep Firm:	
Date:	*12/07/2001*

OPERATING CONDITIONS:

Air Flow:	*60,000 CFM*
Static Pressure:	*4.98 in. Wg.*
Plenum DP:	*0.06 in. Wg.*
Inlet Grill DP:	*0.17 in. Wg.*
TSP:	*5.21 in. Wg.*
Site Altitude:	*0.00 Ft*
TSP @ Sea Level:	*5.21 in. Wg.*

FAN PERFORMANCE:

RPM:	*1760*
BHP:	*20.28*
Efficiency:	*60.8%*
In/Out Velocity:	*2525/3319 FPM*
Plenum Out Velocity:	*678 FPM*

WHEEL SPECIFICATION:

Max RPM:	*1,800*
Diameter x Qty:	*30.4 in. x 4*
Width:	*76%*
Tip Speed:	*14,007 FPM*
Shaft/Bearing Dia.:	*1 15/16" / 1 15/16"*
Inertia:	*27 WR²*

MOTOR SELECTION:

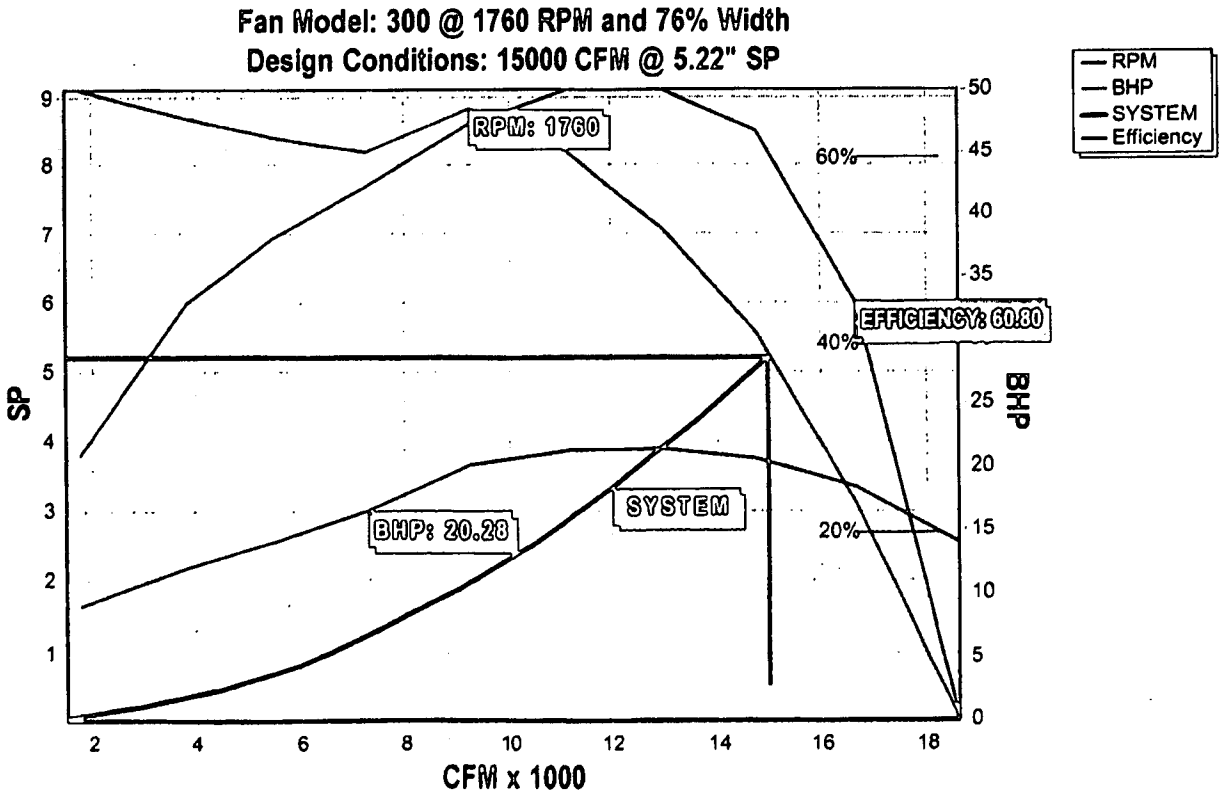
Rated HP / Bypass:	*25 x 4 / No*
Frame Size:	*0.941*
Nominal RPM:	*1760*
VAC/PH/HZ:	*460/3/60*
Efficiency	*Premuim*
Enclosure Type:	*ODP*
Max Inertial Load:	*284T*

FAN SOUND POWER x 4 Fans (In/Out):

Octave Band: **(Re 10^-12 watts)**

1	2	3	4	5	6	7	8
98	*100*	*100*	*100*	*100*	*99*	*95*	*90*
104	*104*	*104*	*108*	*108*	*104*	*102*	*96*

SOUND POWER A-Weighted: **104 / 111 dB**



CL 645

AAON inc.

TULSA OKLAHOMA

Configurator: RL-045-3-0-0A02-133A000-D00-E3F-A00-0000000-00-00000000B

JOB NAME: TYPICAL DRAWINGS TO SHOW FEATURE OPTIONS

UNIT TAG: RTU# 1

Total Weight: 13353 / Shipping Weight: 13353

PURCHASER:

PURCHASE ORDER:

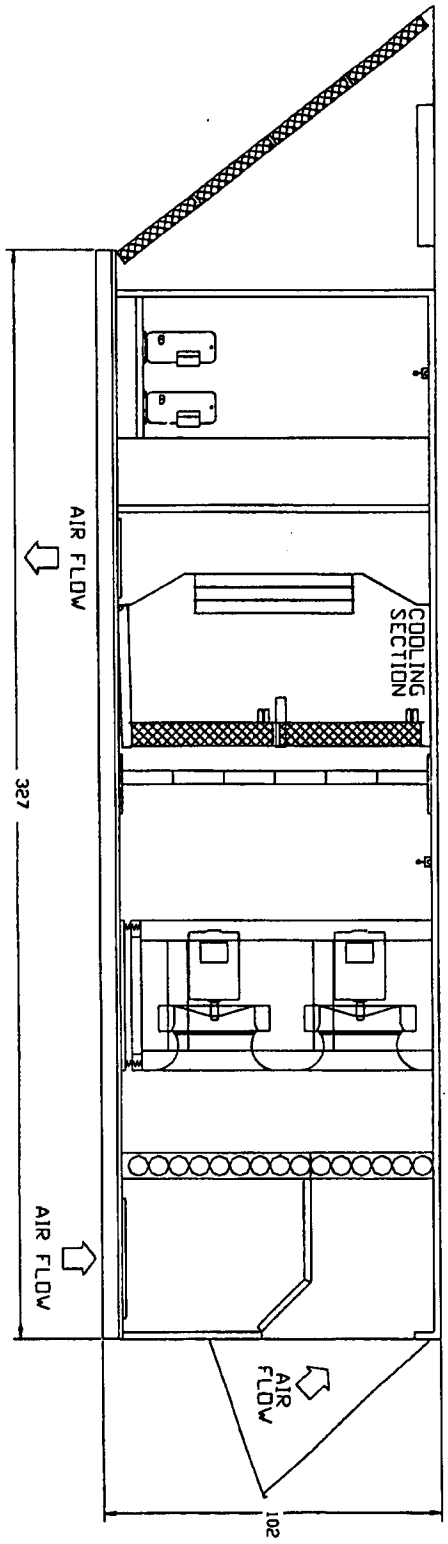
SERIAL NO:

DATE: 02/04/2002

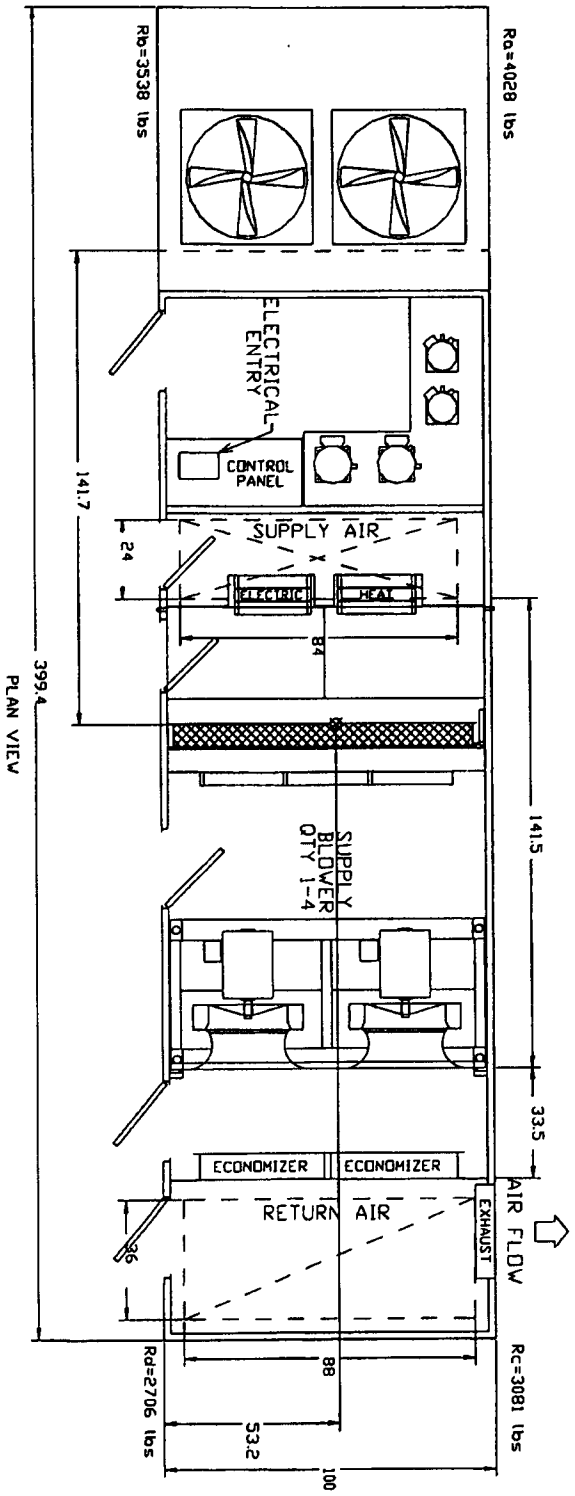
Rep Contact: NOT FOR JOB USE

Ordered By: USE ECAT PROGRAM

Engineer:



ELEVATION VIEW



PLAN VIEW

AAON INC.

TULSA OKLAHOMA

Total Weight: 16051 / Shipping Weight: 16051

Configurator: RL-045-3-0-AA02-000CCCF-D00-EBF-A00-0000000-00-00000000B

JOB NAME: TYPICAL DRAWINGS TO SHOW FEATURE OPTIONS

PURCHASER:

PURCHASE ORDER:

SERIAL NO.:

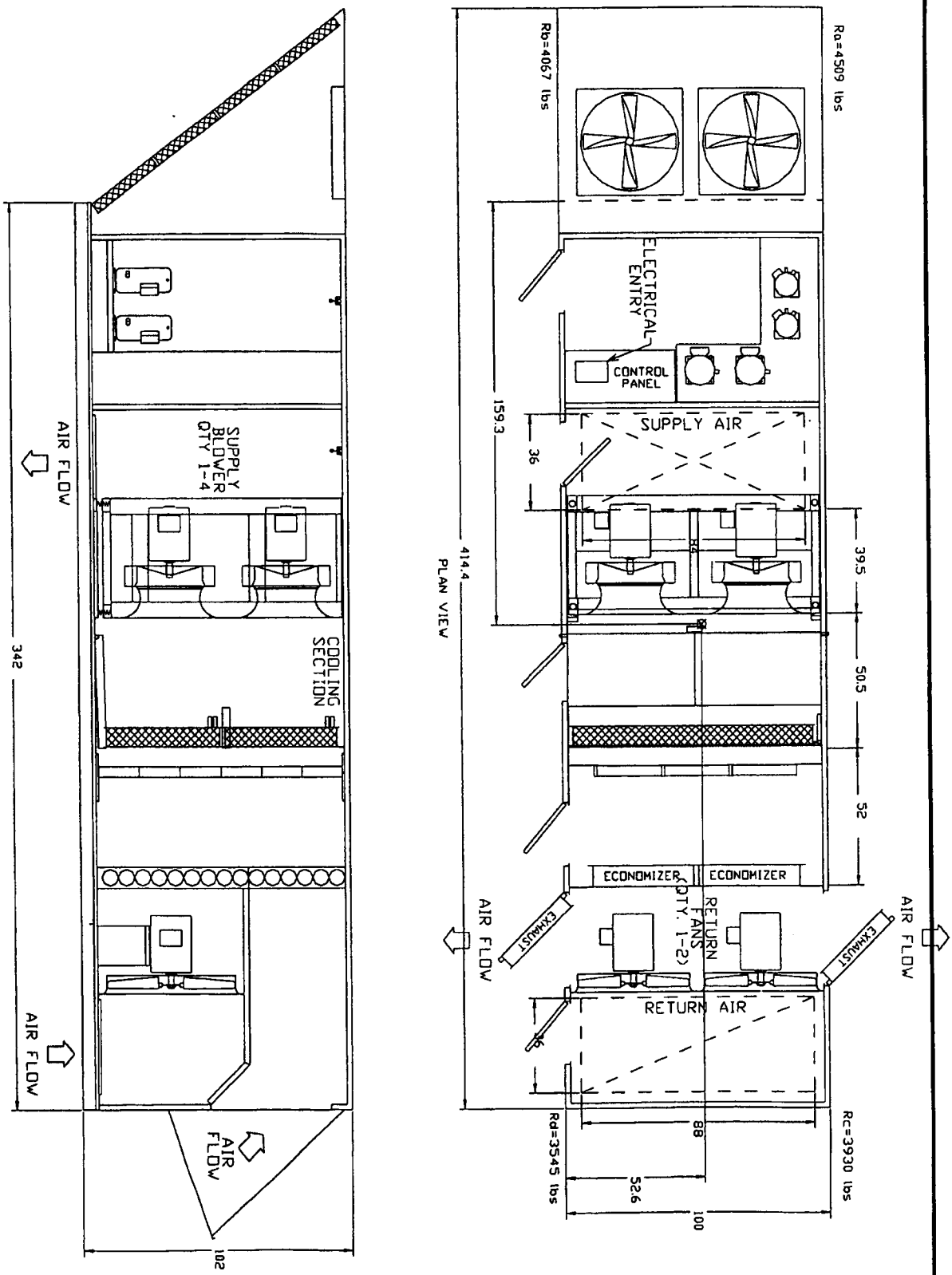
DATE: 02/04/2002

Rep Contact: NOT FOR JOB USE

Ordered By: USE ECAT PROGRAM

Engineer:

UNIT TAG: RTU# 2



AAON inc.

TULSA OKLAHOMA

Total Weight: 17812 / Shipping Weight: 17812

Configurator: RL-095-3-0-AA02-131:BDAD-D00-EAE-A00-0000000-00-00000000B

JOB NAME: TYPICAL DRAWINGS TO SHOW FEATURE OPTIONS

UNIT TAG: RTU# 3

PURCHASER:

PURCHASE ORDER:

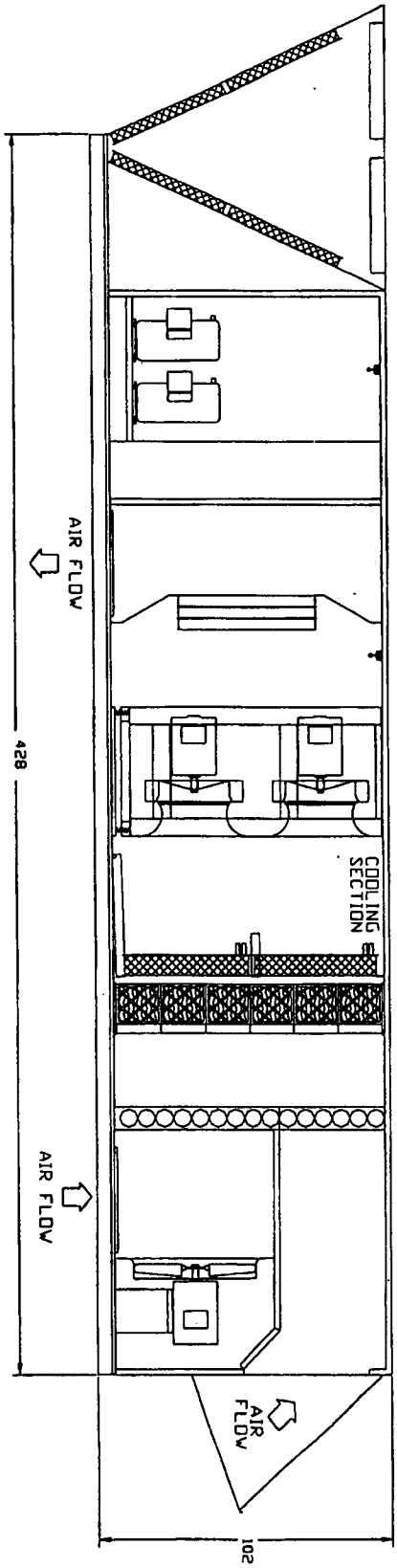
SERIAL NO:

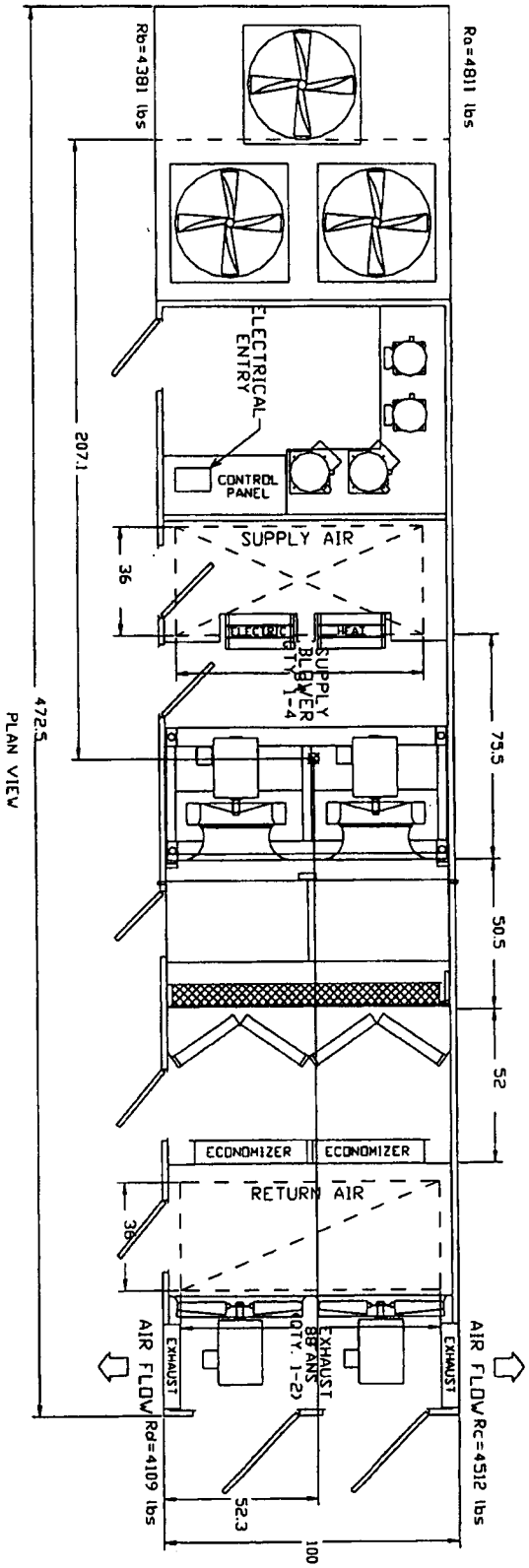
DATE: 02/04/2002

Rep Contact: NOT FOR JOB USE

Ordered By: USE ECAT PROGRAM

Engineer:





AAON inc.

TULSA OKLAHOMA

Total Weight: 20983 / Shipping Weight: 20983

Configurator: RL-095-3-0-AA02-222:DCCG-D00-FAE-A00-000000-00-00000000B

JOB NAME: TYPICAL DRAWINGS TO SHOW FEATURE OPTIONS

UNIT TAG: RTU# 4

PURCHASER:

PURCHASE ORDER:

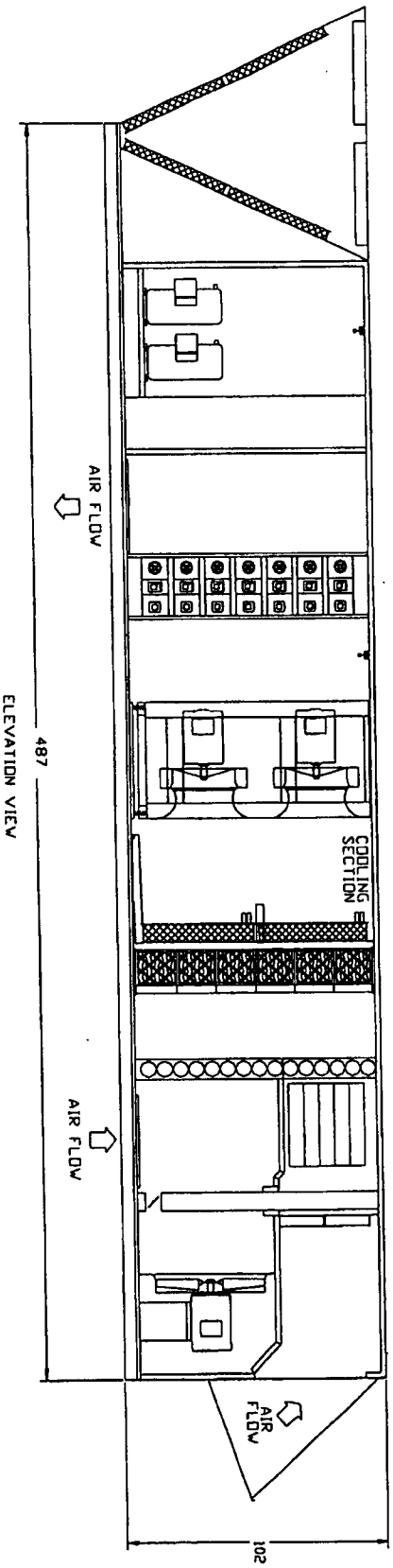
SERIAL NO.:

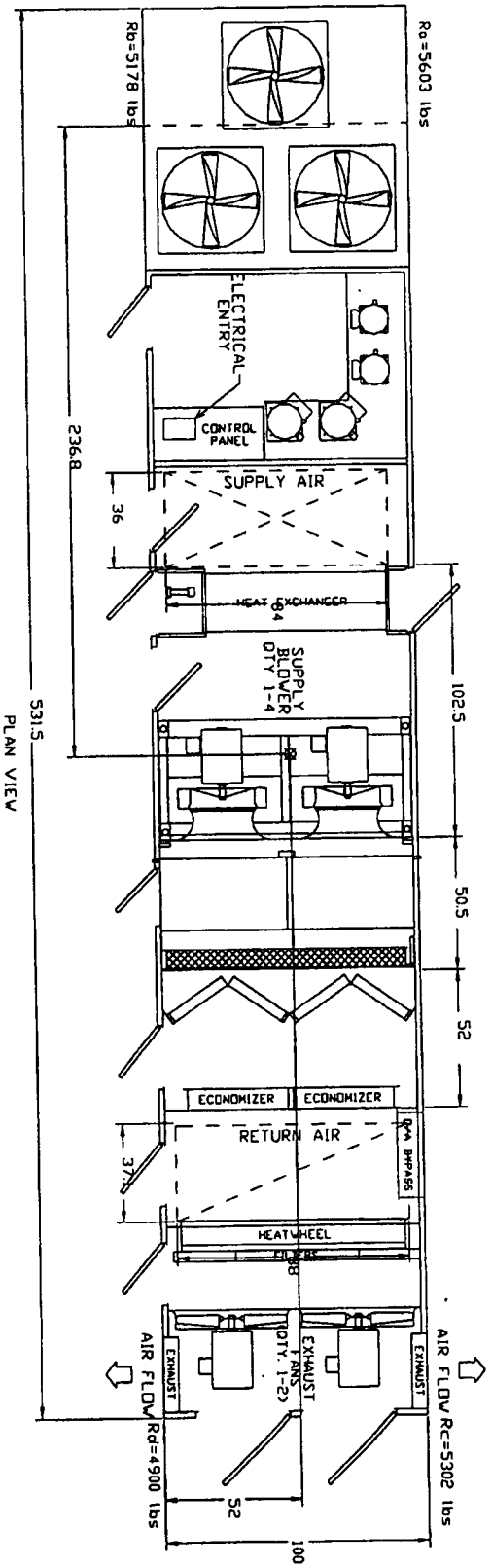
DATE: 02/04/2002

Rep Contact: NOT FOR JOB USE

Ordered By: USE ECAT PROGRAM

Engineer:





AAON inc.

TULSA OKLAHOMA

Total Weight: 25041 / Shipping Weight: 20641

Configurator: RL-135-3-0-0F02-16HCDDF-DDO-FAY-DNC-F0AB000-00-0B0000A0B

JOB NAME: TYPICAL DRAWINGS TO SHOW FEATURE OPTIONS

PURCHASER:

PURCHASE ORDER:

Rep Contact: NOT FOR JOB USE

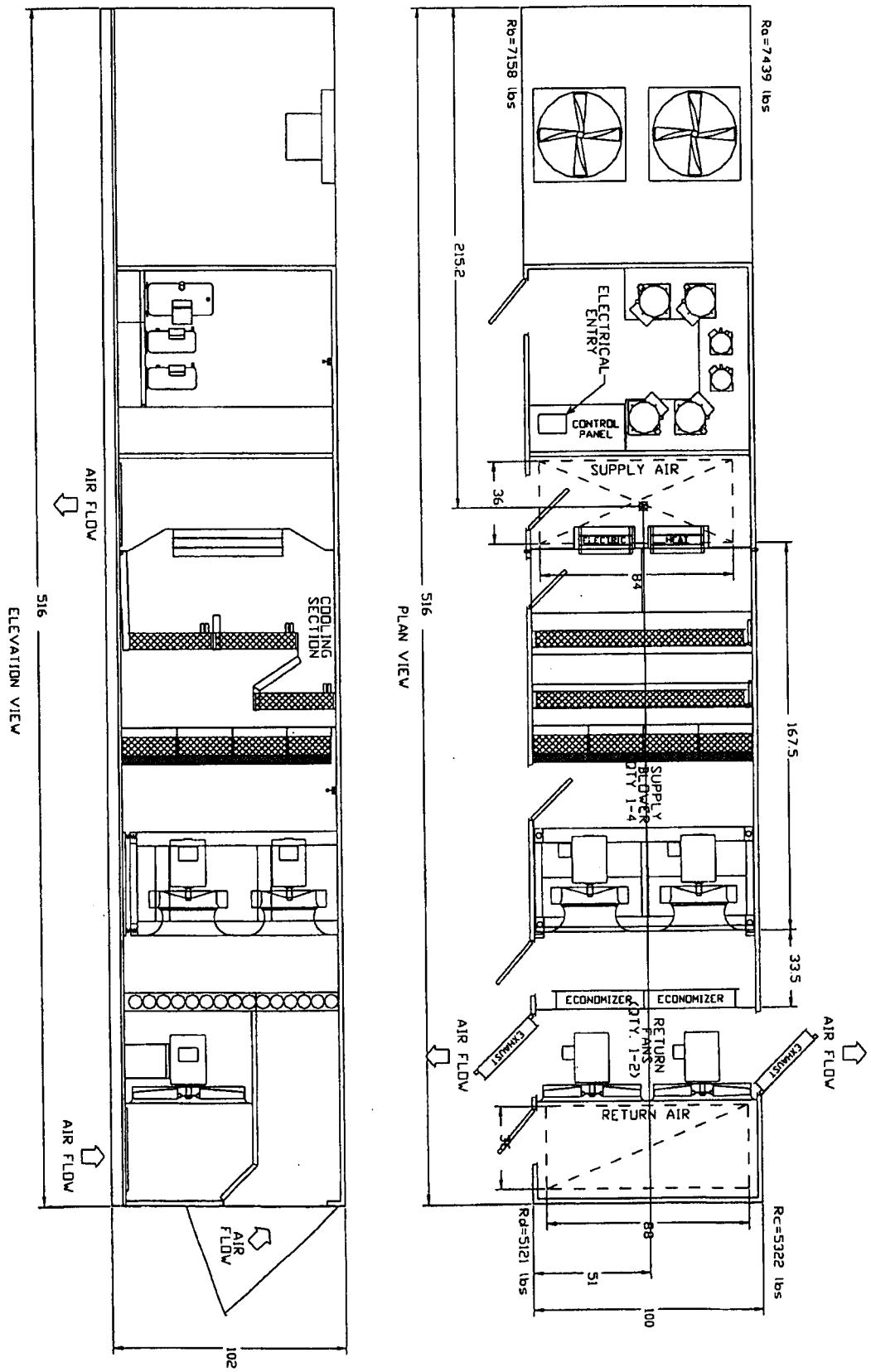
Ordered By: USE ECAT PROGRAM

UNIT TAG: RTU# 5

SERIAL NO.:

DATE: 02/04/2002

Engineer:



AAON inc.

TULSA OKLAHOMA

Configurator: RL-135-3-0-AF02-223CDCF-D00-FAY-DNC-F0AB000-00-ED0000A0B

JOB NAME: TYPICAL DRAWINGS TO SHOW FEATURE OPTIONS

UNIT TAG: RTU# 6

Total Weight: 29442 / Shipping Weight: 25042

PURCHASER:

PURCHASE ORDER:

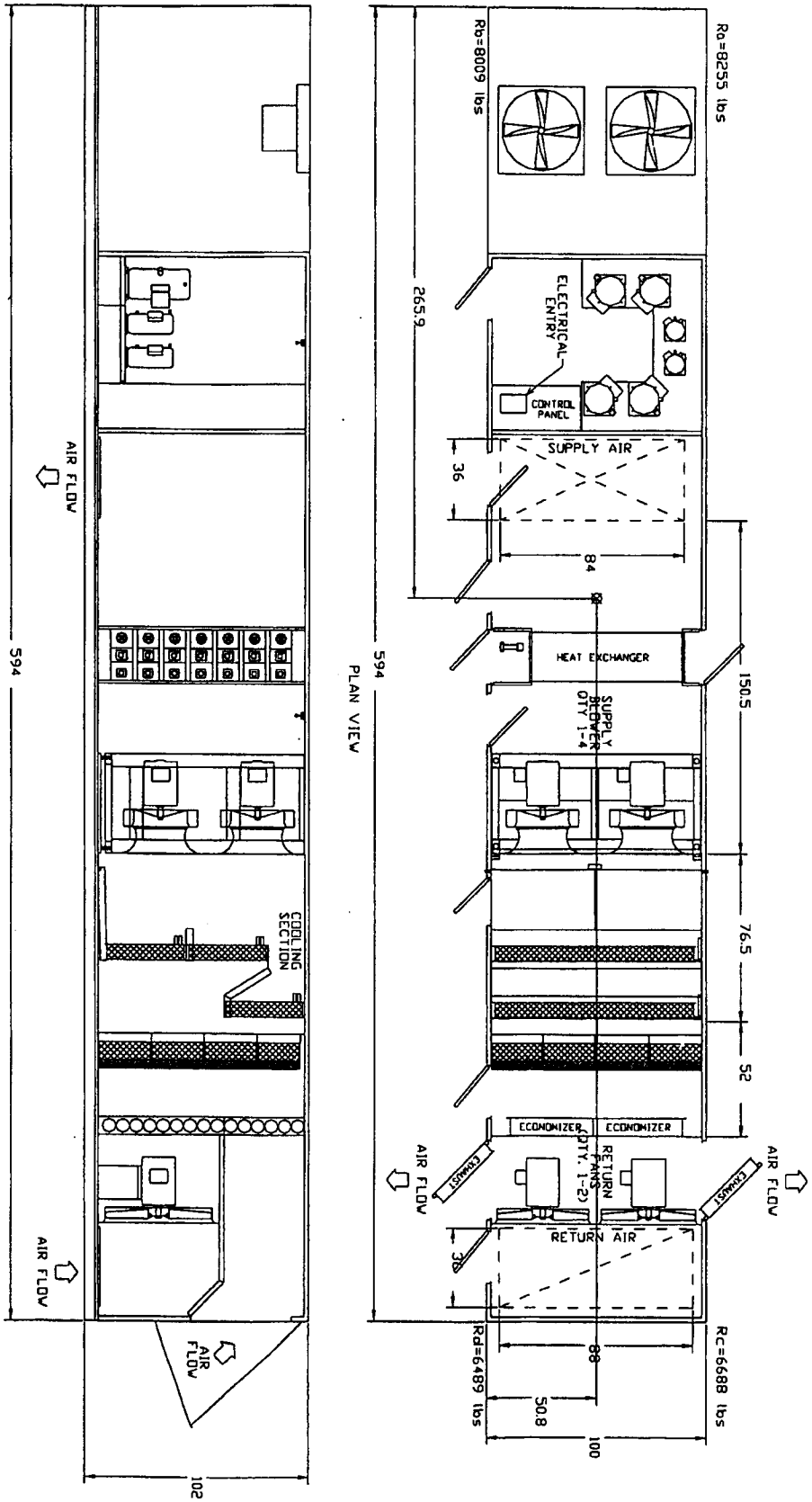
SERIAL NO:

DATE: 02/04/2002

Rep Contact: NOT FOR JOB USE

Ordered By: USE ECAT PROGRAM

Engineer:



CL 651

AAON inc.

TULSA OKLAHOMA

Total Weight: 30816 / Shipping Weight: 30816

Configurator: RL-170-3-0-DA02-233JCDN-D00-EC2-000-000C000-00-00000A00B

JOB NAME: TYPICAL DRAWINGS TO SHOW FEATURE OPTIONS

UNIT TAG: RTU# 7

PURCHASER:

PURCHASE ORDER:

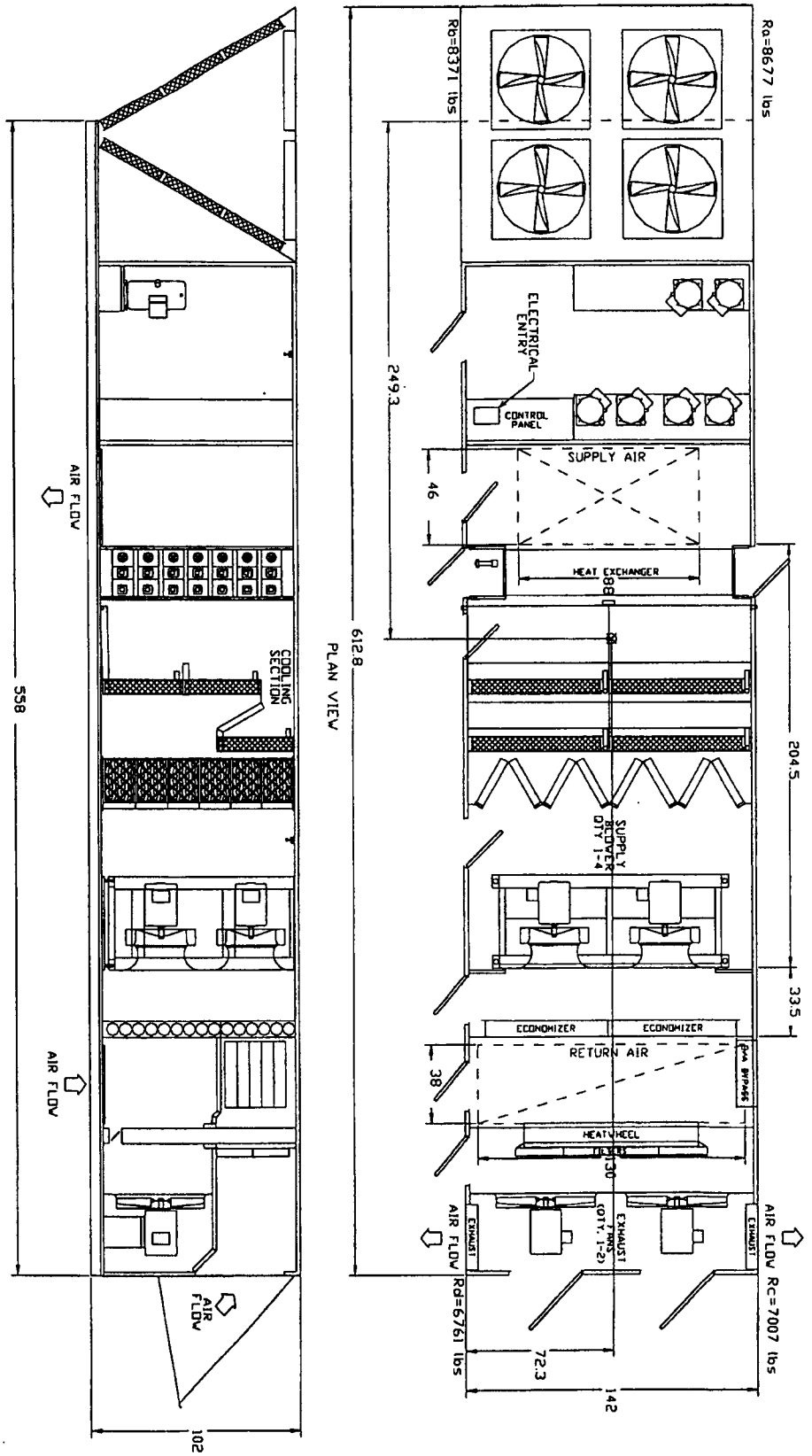
SERIAL NO.:

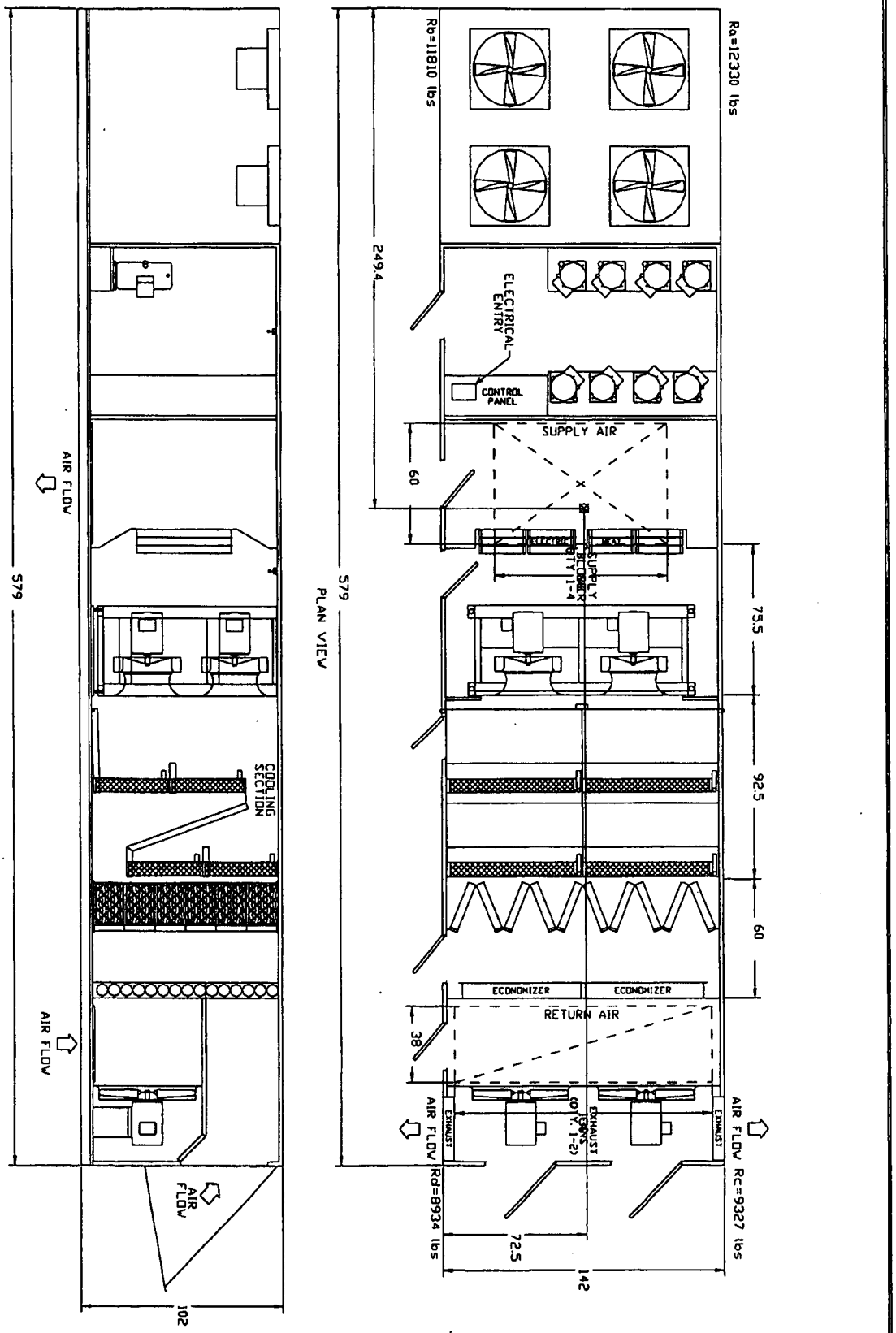
DATE: 02/04/2002

Rep Contact: NOT FOR JOB USE

Ordered By: USE ECAT PROGRAM

Engineer:





AAON inc.

TULSA OKLAHOMA

Total Weight: 42401 / Shipping Weight: 35901

Configurator: RL-230-3-0-AF02-172:BDBH-D00-GCH-A00-00D000-00-00000A0B

JOB NAME: TYPICAL DRAWINGS TO SHOW FEATURE OPTIONS

UNIT TAG: RTU# 8

PURCHASER:

PURCHASE ORDER:

SERIAL NO.:

DATE: 02/04/2002

Rep Contact: NOT FOR JOB USE

Ordered By: USE ECAT PROGRAM

Engineer:

Cooling Coil Psychrometrics

(normal air conditioning range)

AAON, Inc.
2545 South Yukon Ave
Tulsa, Oklahoma 74107
Phone: 918 583 2266 Fax: 918 583 6094

$WB_{entering}$=67.00 [F]

T_1=80.00 [F] wb_1=67.00 [F]

dp_1=60.31 [F] w_1=0.011167 [lbw/lba]

cfm_1=77788.0 [ft^3/min] ρ_1=0.072 [lba/ft^3]

RH_1=51.1 [%]

T_2=55.00 [F] WB_2=54.00 [F]

dp_2=53.29 [F] w_2=0.008632 [lbw/lba]

cfm_2=73887.5 [ft^3/min] ρ_2=0.076 [lba/ft^3]

RH_2=94.0 [%]

$WB_{Leaving}$=54.00 [F]

If the coil is dry, the wet bulb leaving is based on the leaving dry bulb temperature and entering humidity ratio.

Q_{total}=2993698.5 [Btu/hr] 249.47 [tons]

$Q_{sensible}$=2057327.8 [Btu/hr] 171.44 [tons]

Q_{latent}=936370.7 [Btu/hr] 78.03 [tons]

SCFM=74892.6 [ft^3/min]

mfr_{air}=337016.6 [lba/hr]

$mfr_{condensate}$=854.28 [lbw/hr]

SHR=0.687

ALTITUDE=0 [ft] PB=14.696 [psia]

AltitudeStandardCfm=75000.00 [ft^3/min]

K_{sens}=1.0997 K_{lat}=4835

AltStdDen=0.075 [lb_m/ft^3]

Chilled Water Flow Calculator

EWT=44.00 [F] LWT=56.00 [F]

GPM_{CHW}=498.9

Calculate | Psych sea level | Psych 3900 ft | Psych 5300 ft | Psych 7500 ft

Adiabatic Mixing

AAON, Inc.
2425 South Yukon Ave
Tulsa, Oklahoma 74107
Phone: 918 583 2266 Fax: 918 583 6094

Altitude=0 [ft] PB=14.696 [psia] AltStdDen=0.075 [ft^3/lba]

T_1=75.000 [F] WB_1=60.000 [F]

RH_1=41.2 [%] W_1=0.007592 [lbw/lba]

CFM_1=24011.4 [ft^3/min]

$h_{a,1}$=26.329 [Btu/lba]

$M_{a,1}$=105598.5 [lba/hr]

$v_{a,1}$=13.6 [ft^3/lba]

$CFM_{std,1}$=23500 [ft^3/min]

T_3=82.600 [F]

WB_3=67.316 [F]

W_3=0.010797 [lbw/lba]

RH_3=45.4 [%]

CFM_3=44266.3 [ft^3/min]

$h_{a,3}$=31.698 [Btu/lba]

$M_{a,3}$=190978.1 [lba/hr]

$v_{a,3}$=13.9 [ft^3/lba]

$CFM_{std,3}$=42500 [ft^3/min]

T_2=92.00 [F] WB_2=75.00 [F]

RH_2=45.8 [%] W_2=0.0147 [lbw/lba]

CFM_2=20258.8 [ft^3/min]

$h_{a,2}$=38.368 [Btu/lba]

$M_{a,2}$=85377.5 [lba/hr]

$v_{a,2}$=14.2 [ft^3/lba]

$CFM_{std,2}$=19000 [ft^3/min]

All CFM Input are actual air conditions CFMstd Output are Altitude Standard Air Conditions

Calculate | Sea Level | 3900 ft | 5300 ft | 7500 ft

MIXED AIR CONDITIONS

Purpose:

Use this routine to determine the Mixed Air Conditions for Blow Through Systems when the Cooling Coil Entering Conditions and CFM_{SA} are known.

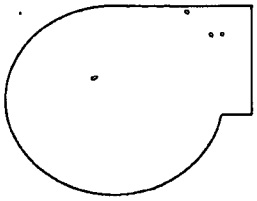
AAON, Inc.
2425 South Yukon Ave
Tulsa, Oklahoma 74107
Phone: 918 583 2266 Fax: 918 583 6094

CCEADB=84.11 [F]

CCEAWB=67.58 [F]

MADB=80.99 [F]

MAWB=66.59 [F]



CFM_{SA}=18500.0 [ASCFM]

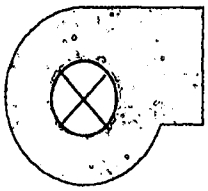
Qty=3 BHP=7.44 [bhp]

η_{Motor}=89.5 [%]

Calculate ALTITUDE=0 [ft] PB=14.7 [psia]

AAON, INC.
Tulsa, Oklahoma 74107
2545 South Yukon Ave
Phone: 918 583 2266 Fax 918 583 6094

Fan Law Calculator



RPM_{base}=1200.0	NewRpm$_1$=1200.0	**NewRpm$_2$=1200.0**	NewRpm$_3$=1200.0
cfm_{base}=10000.0 [cfm]	**NewFanCFM$_1$=8750.0 [cfm]**	NewFanCFM$_2$=8750.0 [cfm]	NewFanCFM$_3$=8750.0 [cfm]
SP_{base}=4.000 [in.wg.]	NewFanSP$_1$=4.000 [in.wg.]	NewFanSP$_2$=4.000 [in.wg.]	**NewFanSP$_3$=4.000 [in.wg.]**
BHP_{base}=10.0 [hp]	NewFanBhp$_1$=8.7 [bhp]	NewFanBhp$_2$=8.8 [bhp]	NewFanBhp$_3$=8.7 [bhp]
η_{base}=63.0 [%]	NewFan$_{ETA,1}$=63.032 [%]	NewFan$_{ETA,2}$=63.032 [%]	NewFan$_{ETA,3}$=63.032 [%]
Dia_{base}=27.00 [in.]	**NewDiameter$_1$=27.0 [in.]**	**NewDiameter$_2$=27.0 [in.]**	**NewDiameter$_3$=27.0 [in.]**
$Width_{base}$=8.0 [in.]	**NewWidth$_1$=7.0 [in.]**	**NewWidth$_2$=7.0 [in.]**	**NewWidth$_3$=7.0 [in.]**

Calculate

Single Zone Blow Through System Psychrometrics

AAON, Inc.
2545 South Yukon Ave
Tulsa, Ok 74107
Phone: 918 583 2266 Fax: 918 583 6094

CCEADB=88.4 [F] CCLADB=50.0 [F]
CCEAWB=67.5 [F] CCLAWB=49.2 [F]

CCTH=48.9 [tons] 586820 [Btu/hr]
CCSH=38.4 [tons] 461156 [Btu/hr]
CCLH=10.5 [tons] 125665 [Btu/hr]

Fan
CFMOA=5000 [cfm]
MADB=85.2 [F]
MAWB=66.5 [F]
OA
OADB=95.0 [F]
OAWB=72.0 [F]
TRADB=77.00 [F]
Cooling Coil
SDHG%=-0.0
DTDUCT=0.0 [F]
SA
CFMSA=10965 [cfm]
RADB=77.0 [F]
DTRA=2.0 [F]
EA
CFMEA=4000 [cfm]
RAHG%=7.3
RA
CFMRA=9965 [cfm]
RAHG=21811.2 [Btu/hr]
SADB=50.0 [F]
RMDB=75.0 [F]
RSH,RLH
Room
CFM_{inf}=0
RMRH=43.4 [%]
CFMZEA=1000 [cfm]

Supply Fan
FAN_{EFF}=0.55
$MOTOR_{EFF}$=0.93
FAN_{DP}=4.5 [in. wg.]
SFHG%=12.89
DTFAN=3.2 [F]
FNPWR=11.32 [kW]
HP_{fan}=14.12 [hp]

RETURN FAN
$RFAN_{EFF}$=0.55
$RMOTOR_{EFF}$=0.9
$RFAN_{DP}$=0
RFHG%=0
RDTFAN=0.00 [F]
RFNPWR=0.00 [kW]
RHP_{fan}=0.00 [hp]

RSH_{sub}=300000.0 [Btu/hr] RSH=300000.0 [Btu/hr] $RSH_{infiltration}$=0 [Btu/hr]
RLH_{sub}=40000 [Btu/hr] RLH=40000.0 [Btu/hr] $RLH_{infiltration}$=0 [Btu/hr]

ALTITUDE=0 [ft]
PB=14.696 [psia]
All CFM based on
AltStdDen=0.075 [lba/ft^3]
K_{sens}=1.09
K_{lat}=4835

Psych Sea Level | Psych 3900 ft | Psych 5000 ft | Psych 5300 ft | Psych 7500 ft | Psych 10000 ft
Calculate

Single Zone Draw Through System Psychrometrics

AAON, Inc.
2425 South Yukon Ave
Tulsa, Oklahoma 74107
Phone: 918 583 2266 Fax: 918 583 6094

CCEADB=85.2 [F] CCLADB=46.8 [F]
CCEAWB=65.9 [F] CCLAWB=46.1 [F]

CCTH=50.6 [tons] 606919 [Btu/hr]
CCSH=38.4 [tons] 461065 [Btu/hr]
CCLH=12.2 [tons] 145855 [Btu/hr]

MADB=85.2 [F]
MAWB=65.9 [F]
CFMOA=5000 [cfm]
SDHG%=-0.0
DTDUCT=0.0 [F]
OADB=95.0 [F]
OAWB=72.0 [F]
TRADB=77.0 [F]
RADB=77.0 [F] DTRA=2.0 [F]
CFMSA=10982 [cfm]
CFMZEA=1000 [cfm]
CFMEA=4000 [cfm]
RAHG%=7.3
CFMRA=9982 [cfm]
RAHG=21814.5 [Btu/hr]
SADB=50.0 [F]
RMDB=75.0 [F]
CFM_{inf}=0 [cfm]
RMRH=38.9 [%]

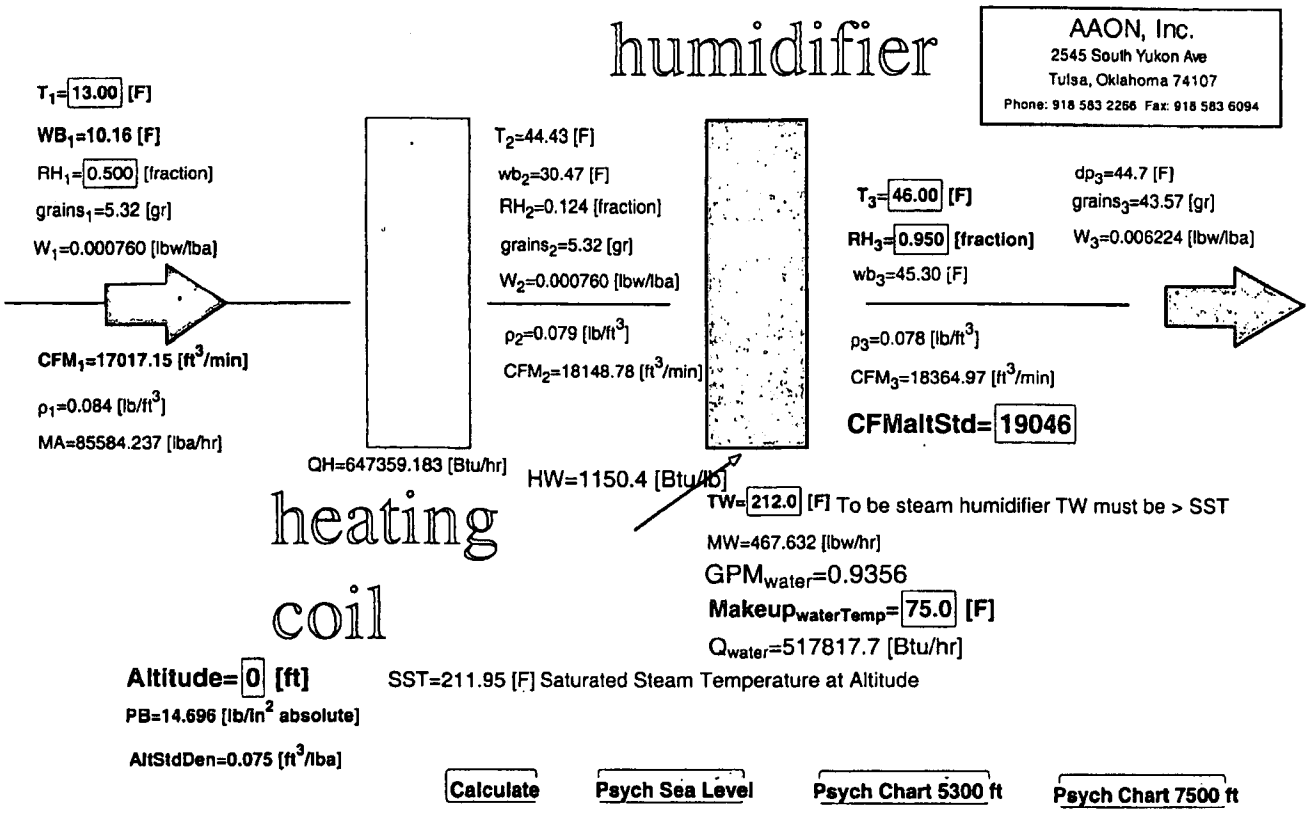
Supply Fan
FAN_{EFF}=0.55
$MOTOR_{EFF}$=0.93
FAN_{DP}=4.5 [in. wg.]
SFHG%=12.91
DTFAN=3.2 [F]
FNPWR=11.34 [kW]
HP_{fan}=14.14 [hp]

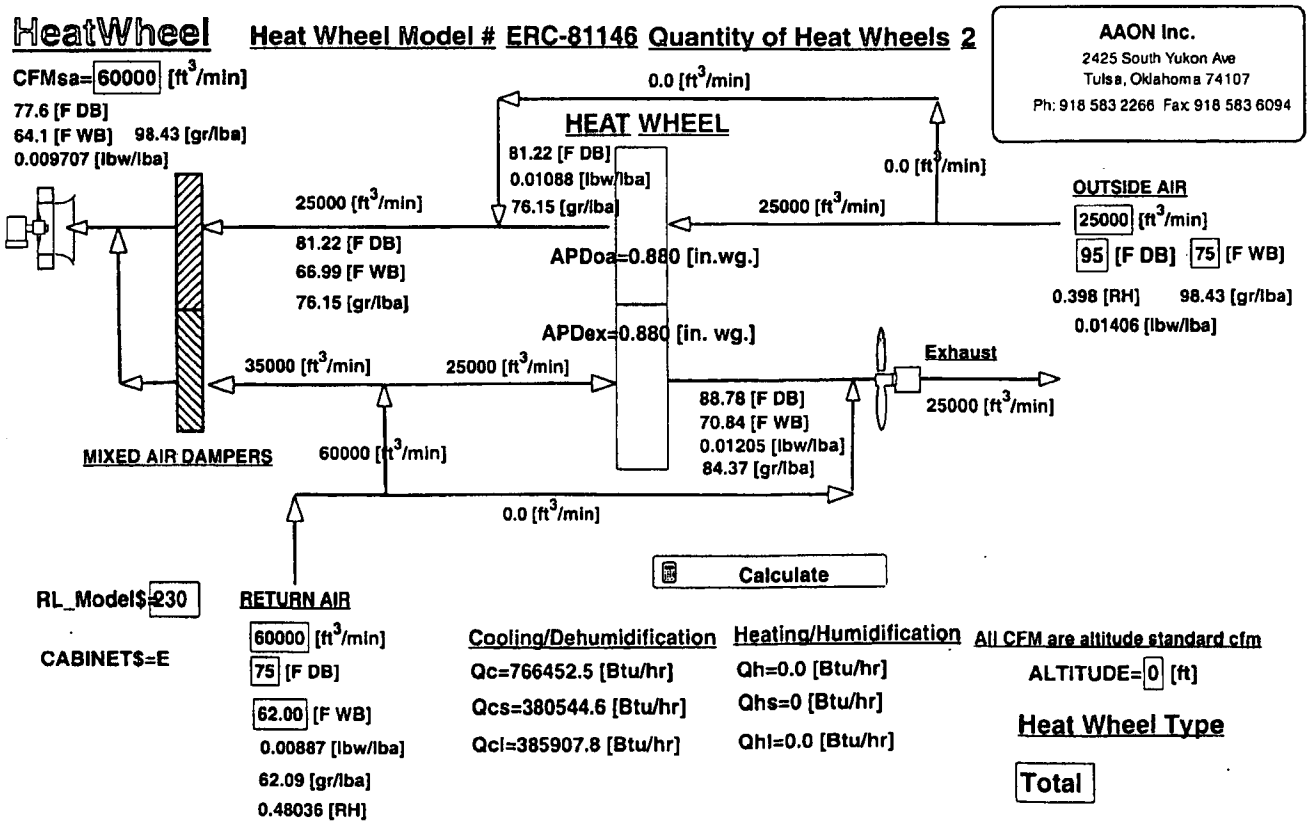
Return Fan
$RFAN_{EFF}$=0.550
$RMOTOR_{EFF}$=0.9
$RFAN_{DP}$=0.0 [in.wg.]
RFHG%=0.00
RDTFAN=0.000 [F]
RFNPWR=0.00 [kW]
RHP_{fan}=0.0 [hp]

RSH_{sub}=300000 [Btu/hr] $RSH_{infiltration}$=0 [Btu/hr] RSH=300000.0 [Btu/hr]
RLH_{sub}=40000 [Btu/hr] $RLH_{infiltration}$=0 [Btu/hr] RLH=40000 [Btu/hr]
RSHR=0.8824

ALTITUDE=0 [ft]
PB=14.696 [psia]
AltStdDen=0.075 [ft^3/lba]
K_{sens}=1.09
K_{lat}=4835

Calculate | Psych Sea Level | Psych 3900 ft | Psych 5300 ft | Psych 7500 ft


humidifier
AAON, Inc.
2545 South Yukon Ave
Tulsa, Oklahoma 74107
Phone: 918 583 2266 Fax: 918 583 6094
T1=13.00 [F]
WB1=10.16 [F]
RH1=0.500 [fraction]
grains1=5.32 [gr]
W1=0.000760 [lbw/lba]
CFM1=17017.15 [ft3/min]
ρ1=0.084 [lb/ft3]
MA=85584.237 [lba/hr]
QH=647359.183 [Btu/hr]
T2=44.43 [F]
wb2=30.47 [F]
RH2=0.124 [fraction]
grains2=5.32 [gr]
W2=0.000760 [lbw/lba]
ρ2=0.079 [lb/ft3]
CFM2=18148.78 [ft3/min]
HW=1150.4 [Btu/lb]
T3=46.00 [F]
RH3=0.950 [fraction]
wb3=45.30 [F]
dp3=44.7 [F]
grains3=43.57 [gr]
W3=0.006224 [lbw/lba]
ρ3=0.078 [lb/ft3]
CFM3=18364.97 [ft3/min]
CFMaltStd=19046
heating coil
TW=212.0 [F] To be steam humidifier TW must be > SST
MW=467.632 [lbw/hr]
GPMwater=0.9356
Makeupwatertemp=75.0 [F]
Qwater=517817.7 [Btu/hr]
Altitude=0 [ft]
SST=211.95 [F] Saturated Steam Temperature at Altitude
PB=14.696 [lb/in2 absolute]
AltStdDen=0.075 [ft3/lba]
Calculate
Psych Sea Level
Psych Chart 5300 ft
Psych Chart 7500 ft


HeatWheel
Heat Wheel Model # ERC-81146 Quantity of Heat Wheels 2
AAON Inc.
2425 South Yukon Ave
Tulsa, Oklahoma 74107
Ph: 918 583 2266 Fax 918 583 6094
CFMsa=60000 [ft3/min]
77.6 [F DB]
64.1 [F WB] 98.43 [gr/lba]
0.009707 [lbw/lba]
0.0 [ft3/min]
HEAT WHEEL
81.22 [F DB]
0.01088 [lbw/lba]
76.15 [gr/lba]
0.0 [ft3/min]
25000 [ft3/min]
25000 [ft3/min]
OUTSIDE AIR
25000 [ft3/min]
95 [F DB] 75 [F WB]
0.398 [RH] 98.43 [gr/lba]
0.01406 [lbw/lba]
81.22 [F DB]
66.99 [F WB]
76.15 [gr/lba]
APDoa=0.880 [in.wg.]
APDex=0.880 [in. wg.]
35000 [ft3/min]
25000 [ft3/min]
Exhaust
88.78 [F DB]
70.84 [F WB]
0.01205 [lbw/lba]
84.37 [gr/lba]
25000 [ft3/min]
MIXED AIR DAMPERS
60000 [ft3/min]
0.0 [ft3/min]
Calculate
RL_Model$=230
CABINET$=E
RETURN AIR
60000 [ft3/min]
75 [F DB]
62.00 [F WB]
0.00887 [lbw/lba]
62.09 [gr/lba]
0.48036 [RH]
Cooling/Dehumidification
Qc=766452.5 [Btu/hr]
Qcs=380544.6 [Btu/hr]
Qcl=385907.8 [Btu/hr]
Heating/Humidification
Qh=0.0 [Btu/hr]
Qhs=0 [Btu/hr]
Qhl=0.0 [Btu/hr]
All CFM are altitude standard cfm
ALTITUDE=0 [ft]
Heat Wheel Type
Total

CL 657

Langelier Saturation Index Calculator

T= 101.7 [F] 38.7 [C]

pH= 7.100

TDS= 660.0 [mg/L]

Calcium= 392.0 [mg/L as $CaCO_3$]

Alkalinity= 76.0 [mg/L as $CaCO_3$]

$Conductivity_{Approximate}$=1453 [micro-mho/cm]

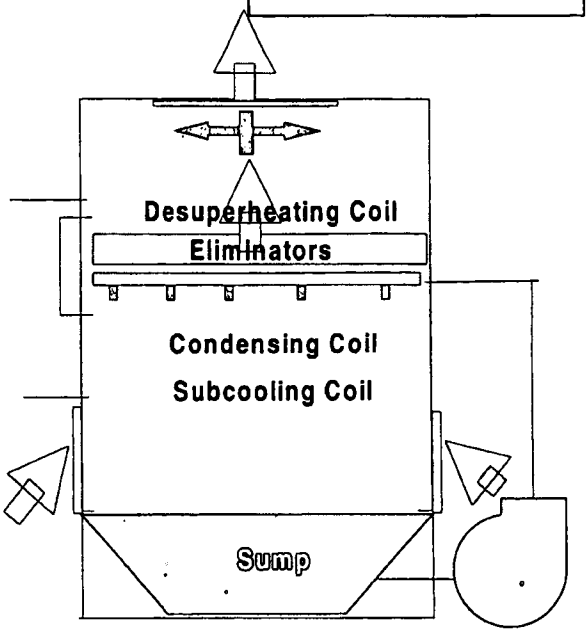
LSI=-0.1396

Border Line Scale Potential

LSI Calculator

Internet Link to Information on Corrosion

AAON Inc.
2425 South Yukon Ave
Tulsa, Oklahoma 74107
Phone: 918 583 2266 Fax: 918 583 6094



Sensible Heating

AAON Inc.
2425 South Yukon Ave
Tulsa, Oklahoma 74107
Ph: 918 583 2266 FX: 918 583 6094

ALTITUDE= 0 [ft] PB=14.70 [psia]

T_1= 80.0 [F]

WB_1= 67.0 [F] MaxWB=67 [F]

CFM_1=20743.5 [ft^3/min]

RH_1=0.511 [fraction]

ρ_1=0.072 [lba/ft^3]

DP_1=60.31 [F]

W_1=0.01117 [lbw/lba]

QS=50900.0 [Btu/hr]

MFA=89871.1 [lba/hr]

altstdcfm= 20000.0 [ft^3/min]

T_2=82.3 [F]

wb_2=67.7 [F]

CFM_2=20832.2 [ft^3/min]

RH_2=0.474 [fraction]

ρ_2=0.072 [lba/ft^3]

DP_2=60.31 [F]

W_2=0.01117 [lbw/lba]

K_{sens}=1.102

AltStdDen=0.075 [lab/ft^3]

$Q_{SENSIBLE}$= 0.0 [Btu/hr] BHP= 20.000 [hp] WATTS= 0.0 [watts]

Calculate

Sensible Heating 2

AAON Inc.
2424 South Yukon Ave
Tulsa, Oklahoma 74107
Ph: 918 583 2266 FX: 918 583 6094

ALTITUDE= 0 **[ft]** PB=14.70 [psia]

T_1= 60.0 [F]

WB_1= 55.0 [F] MaxWB=55 [F]

CFM_1=19876.3 [ft^3/min]

RH_1=0.732 [fraction]

ρ_1=0.075 [lba/ft^3]

DP_1=51.42 [F]

W_1=0.00805 [lbw/lba]

QS=438441.1 [Btu/hr]

MFA=89871.1 [lba/hr]

T_2= 80.0 [F]

wb_2=62.5 [F]

CFM_2=20641.3 [ft^3/min]

RH_2=0.370 [fraction]

ρ_2=0.073 [lba/ft^3]

DP_2=51.42 [F]

W_2=0.00805 [lbw/lba]

K_{sens}=1.096

AltStdDen=0.075 [lab/ft^3]

altstdcfm= 20000.0 [ft^3/min]

Calculate

Pressure Drop Steam Piping

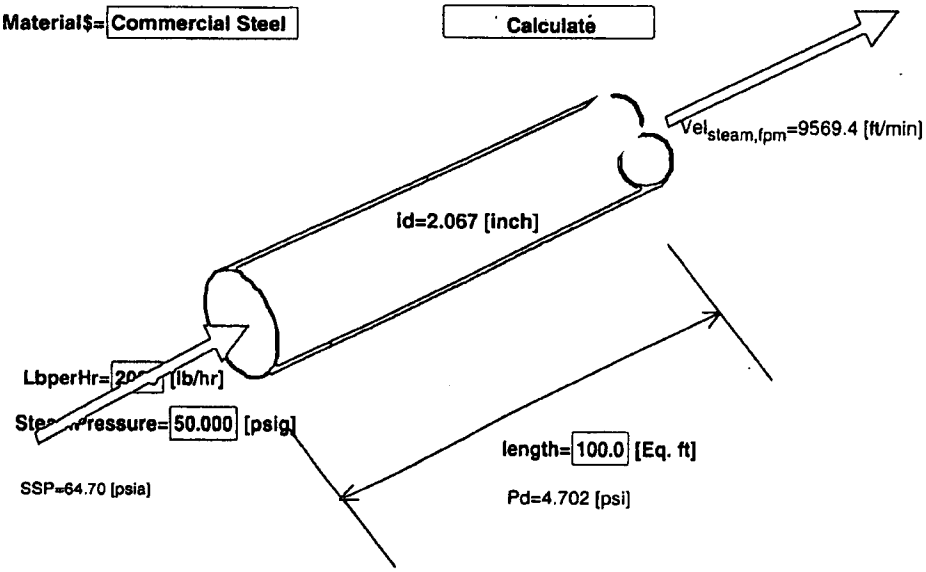
AAON Inc.
2425 South Yukon Ave
Tulsa, Oklahoma 74107
Phone 918 583 2266 Fax 918 583 6094

AtmosphericPressure= 14.7 **[psia]**

ε=0.00015000 [Pipe Roughness]

Material$= Commercial Steel

Calculate



Pipe Size Schedule 40

Nominal$= 2 inch

Pressure Drop Water Piping

AAON Inc.
2424 South Yukon Ave
Tulsa, Oklahoma 74107
Ph: 918 583 2266 Fx: 918 583 6094

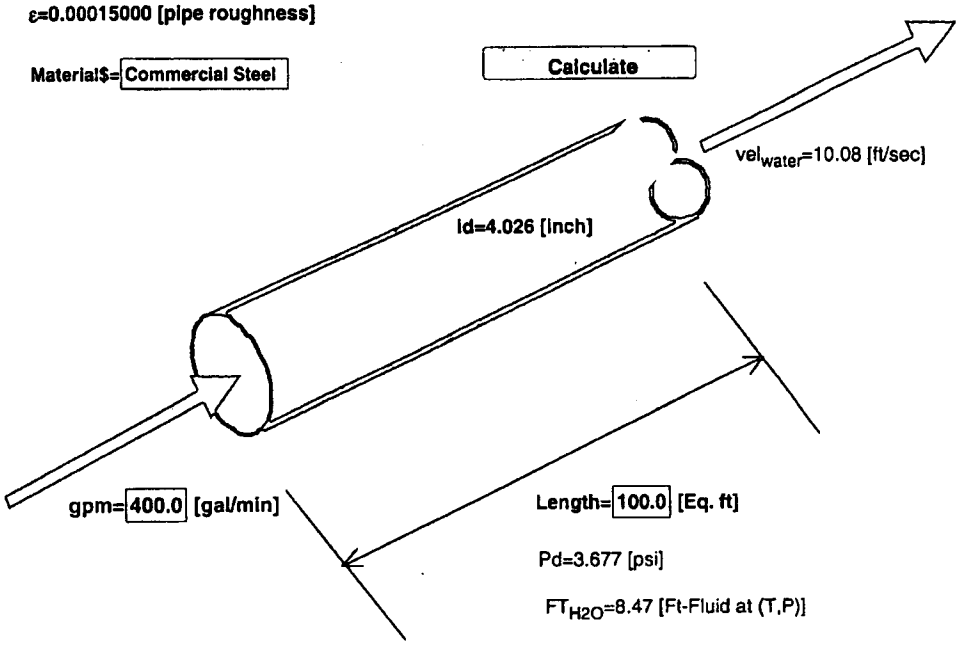
P=80.000 [psia]

t=60.000 [F]

ε=0.00015000 [pipe roughness]

Material$=Commercial Steel

Calculate



Pd=3.677 [psi]

FT_{H2O}=8.47 [Ft-Fluid at (T,P)]

Schedule 40 Nominal Diameter

Nominal$=4 inch

Duct Pressure Drop

AAON Inc.
2425 South Yukon Ave
Tulsa, Oklahoma 74107
Ph: 918 583 7407 Fax: 918 583 6094

Altitude=0

PB=14.70 [psia]

DB=70.000 [F]

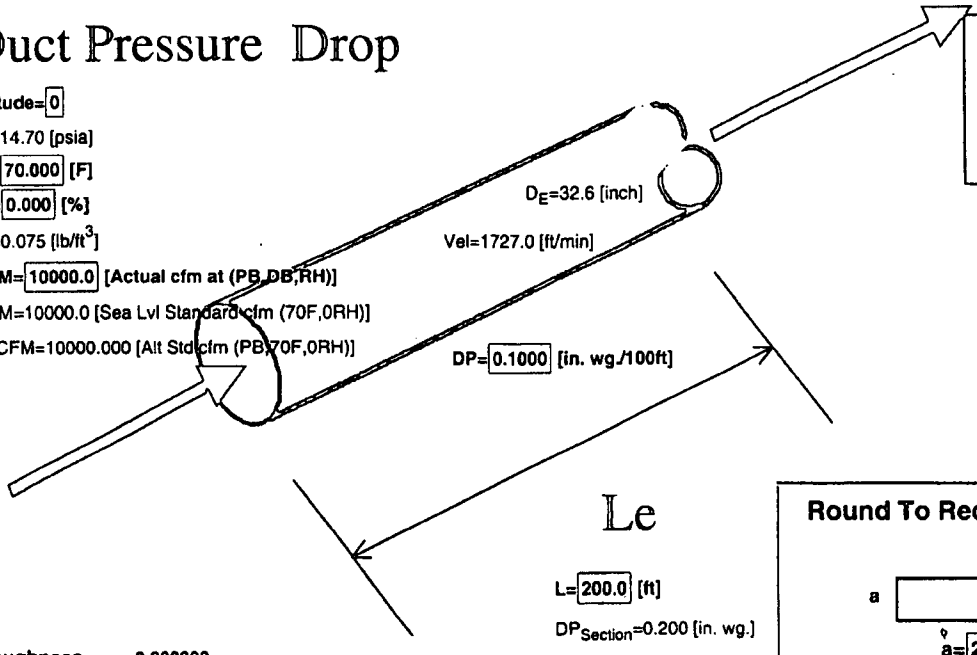
RH=0.000 [%]

ρ_{air}=0.075 [lb/ft^3]

ACFM=10000.0 [Actual cfm at (PB,DB,RH)]

SCFM=10000.0 [Sea Lvl Standard cfm (70F,0RH)]

AltSCFM=10000.000 [Alt Std cfm (PB,70F,0RH)]



Le

L=200.0 [ft]

$DP_{Section}$=0.200 [in. wg.]

Roughness ε=0.000300

DuctMaterial$=Galvanized Steel Medium Smooth

Calculate

Round To Rectangular Conversion

b

a

a=20.0 [inch]

b=46.4 [inch]

Vel_{actual}=1552.7 [ft/min]

CL 660